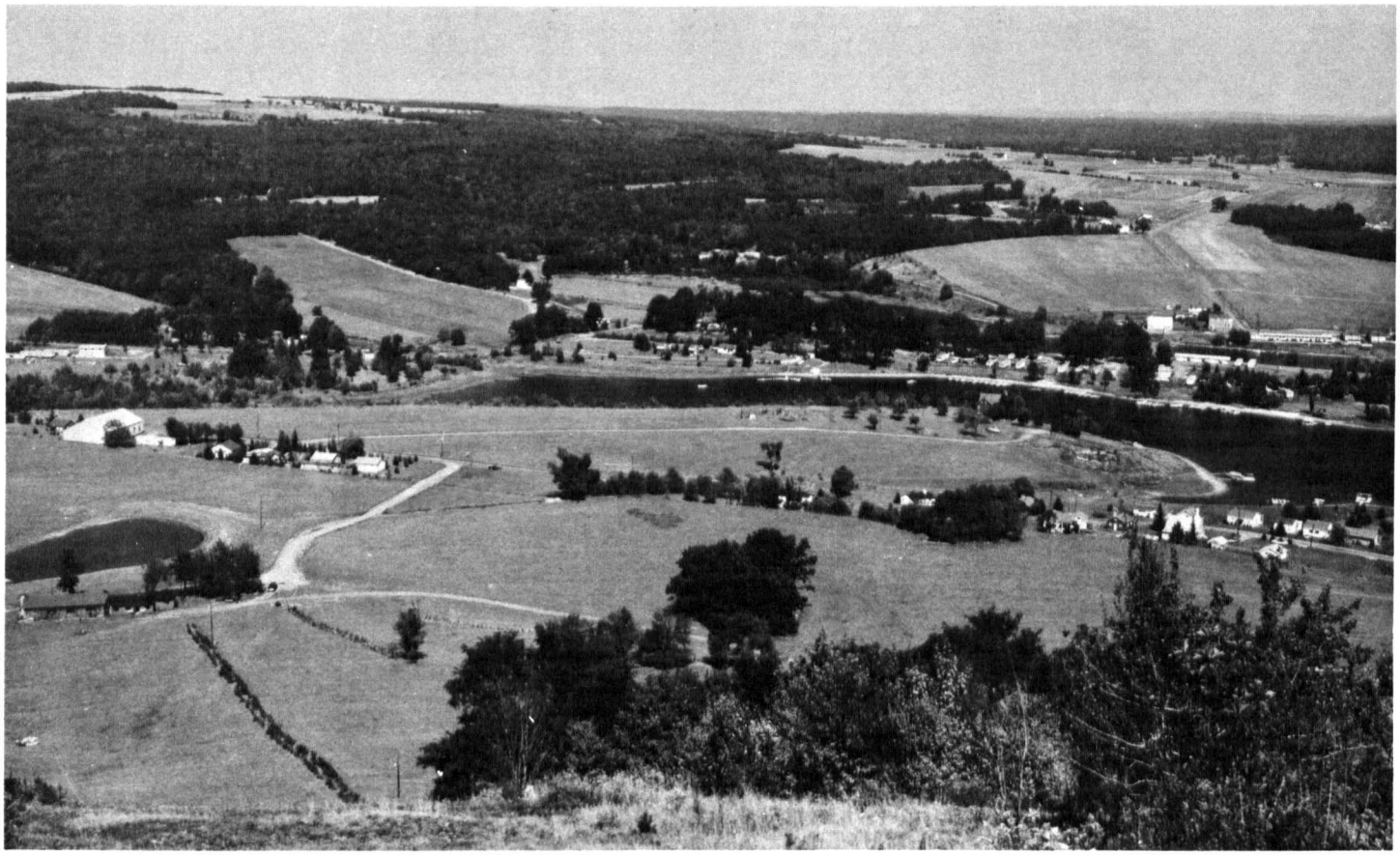
# SOIL SURVEY OF

# Garrett County, Maryland



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

Issued August 1974

**Major fieldwork for this soil survey was done in the period 1944–68. Soil names and descriptions were approved in 1970. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1969. This survey was made cooperatively by the Soil Conservation Service and the Maryland Agricultural Experiment Station. It is part of the technical assistance furnished to the Garrett 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, United States Department of Agriculture, 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 Garrett 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 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 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 capability units.

*Foresters and others* can refer to the section "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 "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 "Town and Country Planning."

*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 Garrett 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 in the section "Climate of Garrett County."

***Cover:*** **Recreational and residential development around the upper end of Deep Creek Lake, near McHenry. Nonwooded, gently sloping soils in the background are mainly of the Ungers, Gilpin, and Calvin series. The wooded areas are mainly very stony Dekalb, Leetonia, and Gilpin soils. The soils in the foreground are mainly of the Meckesville and Gilpin series.**

☆ U. S. GOVERNMENT PRINTING OFFICE : 1974 O - 478-938

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

# Contents





Issued August 1974

# SOIL SURVEY OF GARRETT COUNTY, MARYLAND

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

GARRETT COUNTY is the westernmost county in Maryland (fig. 1). It has a land area of 423,680 acres, or 662 square miles. Oakland, the county seat and largest

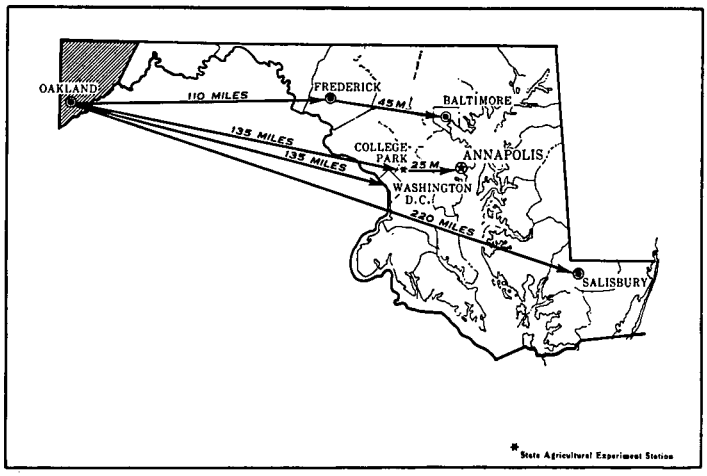


*Figure 1.*—**Location of Garrett County in Maryland.**

town, is in the southwestern part of the county. Other important towns are Accident, Deer Park, Friendsville, Grantsville, Kitzmiller, and Mountain Lake Park.

The county is entirely within the Allegheny Plateau and is strongly dissected by the natural drainage pattern. Some of the gently sloping to moderately sloping summits are occupied mainly by moderately deep, well-drained, nonstony soils that are highly useful in farming. In the valleys are soils on flood plains and terraces that are also useful in farming, but which are limited in capability by wetness and are used mostly for forage crops and pasture. In most of the county, however, the soils are steep, very stony, or both, and are better suited to woodland, wildlife habitat, and recreational uses than they are to farming.

The main sources of farm income, in order of importance, are dairy products, livestock and livestock products, poultry and poultry products, farm woodland products, general field crops, and truck crops. Crops grown, in order of acreage, are oats, corn, wheat, and buckwheat. Other important crops are Irish potatoes, apples, and other fruits.

Local markets are available for farm products. Other important markets are Cumberland, Md.; Morgantown, W. Va.; and Uniontown, Pa. The nearest major city is Pittsburgh, Pa.

## *How This Survey Was Made*

Soil scientists made this survey to learn what kinds of soil are in Garrett County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. 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.

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. Elkins and Wharton, 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, Ernest silt loam, 0 to 3 percent slopes, is one of several phases within the Ernest 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 photo-

graphs 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.

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 Garrett 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-Calvin-Lehew very stony loams, 0 to 15 percent slopes, is an example.

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." Brinkerton and Andover silt loams, 3 to 8 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. Stony land, steep, is a land type in Garrett County.

While a soil survey is in progress, samples of soils are taken, as 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 all 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 rangeland, 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 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 current 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 Garrett 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 at least one minor soil, 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 Garrett County are discussed in the following pages.

### 1. *Calvin-Gilpin association*

*Gently sloping to steep, moderately deep, well-drained soils; formed over acid, red to gray shale and sandstone*

This association occupies three major areas in the county. One area extends from near McHenry north-northeastward on both sides of U.S. Highway 219 to the Pennsylvania line. Another extends from near New Germany northeastward to the Pennsylvania line. The third extends from near North Glade southwestward through Oakland to the West Virginia line. The association consists mainly of moderately sloping soils. In some areas the soils are steep, and on crests and broad summits the soils are gently sloping. A typical landscape in this association is shown in figure 2.

This association occupies about 29 percent of the county. Calvin soils make up about 35 percent of the association and Gilpin soils also make up 35 percent. Less extensive soils make up about 30 percent.

The major soils are alike in their most important properties. They are 20 to 40 inches deep over hard shale or sandstone and are well drained. Most areas contain small, hard, flattened fragments of rock, called channers, that are abrasive to many farm implements but do not hinder cultivation. The Calvin soils are reddish brown and red. The Gilpin soils are grayish brown to yellowish brown. They have a somewhat finer textured subsoil than the Calvin soils, and commonly retain a little more moisture that can be used by plants.

Among the less extensive soils in this association are Ungers, Dekalb, Meckesville, Albrights, Ernest, and Cookport soils. Ungers soils are like Calvin soils but have a finer textured, somewhat stickier subsoil. Dekalb soils are like Gilpin soils, but have a coarser textured, some-

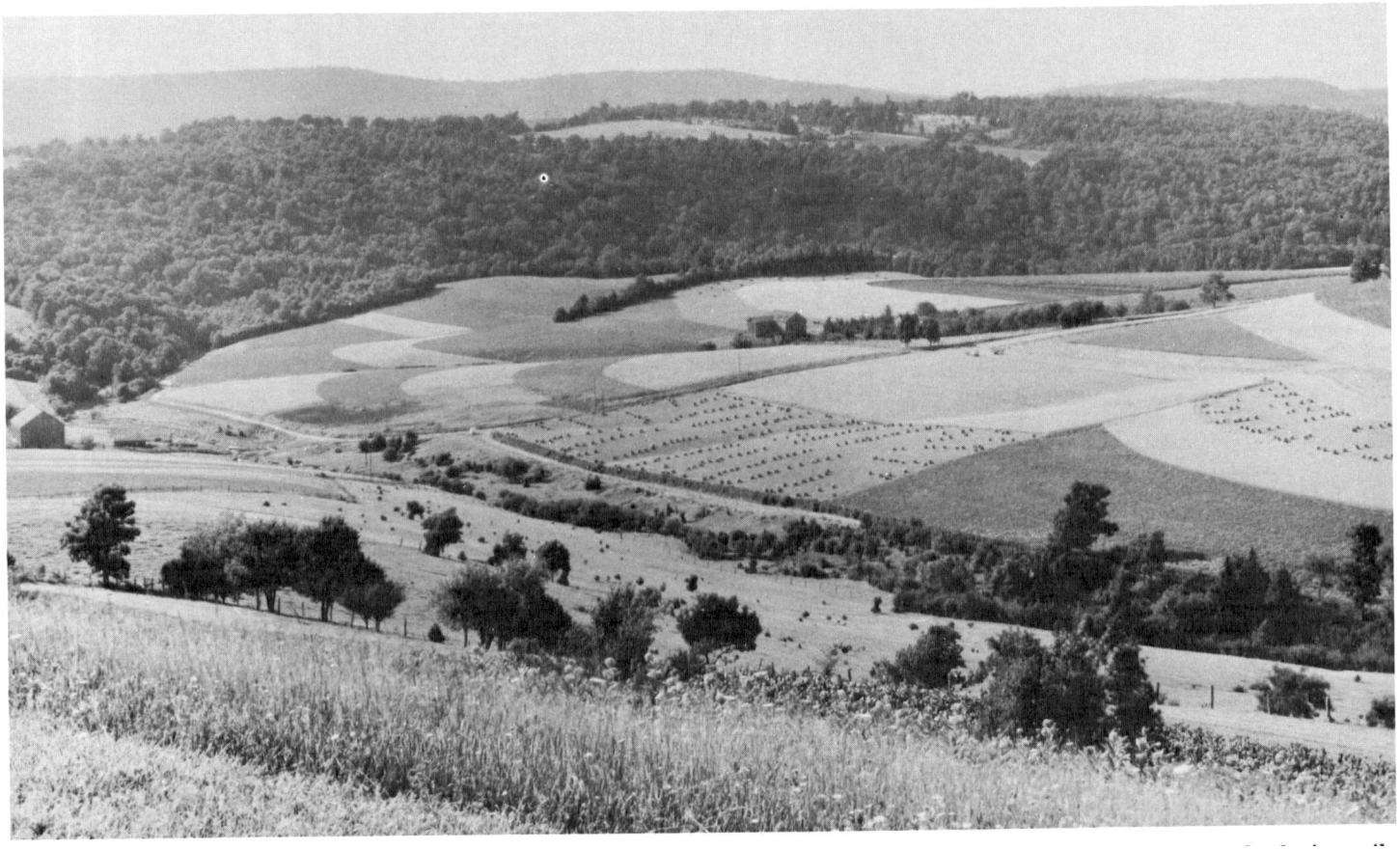

*Figure 2.*—**A typical landscape in the Calvin-Gilpin association, about a mile northeast of Accident. The more moderately sloping soils are intensively cultivated.**

what less sticky subsoil. The other soils have a hardpan or fragipan in the lower part of the subsoil that impedes movement of soil moisture. Albrights, Ernest, and Cookport soils are only moderately well drained.

This association generally supports the most intensive farming in the county. Much of the farming is on the contour (fig. 3); mainly row crops are alternated with strips of hay or other close-growing crops. Many of the farms specialize in producing milk, beef, or other animal products. Large areas, particularly on the stronger slopes, are in hay and pasture. Forage crops grow well on the soils of this association.

The major soils of this association generally are suitable for building sites. The depth to bedrock is only a moderate limitation for basement excavations, and is no limitation for buildings without basements. Slope is a moderate to severe limitation in places. The depth to bedrock is a severe limitation for sewage disposal by septic tanks, and other means of disposal may be required in many places.

### 2. *Gilpin-Cookport-Dekalb association*

*Gently sloping to steep, moderately deep, well drained and moderately well drained soils; formed over acid, gray to yellowish sandstone and shale*

This association occupies two major areas in the county. One area extends from the vicinity of Cunningham Lake, north-northeastward through Bittinger and Grantsville to the Pennsylvania line. The other area includes most of Swallow Falls State Forest and extends southward and slightly westward to the West Virginia line. The association consists mainly of moderately sloping soils. In some areas the soils are gently sloping and steep. Many small areas are very stony.

This association occupies about 9 percent of the county. Gilpin soils make up about 40 percent of the association, Cookport soils about 25 percent, Dekalb soils about 15 percent, and less extensive soils about 20 percent.

The major soils are about 20 to 40 inches deep over hard sandstone or shale. Most areas contain small, hard, flattened fragments of rock, called channers, that are abrasive to many farm implements but do not hinder cultivation. Gilpin and Dekalb soils are grayish brown to yellowish brown in color and are well drained. Gilpin soils have a somewhat finer textured subsoil than Dekalb soils, and retain a little more moisture that can be used by plants. Cookport soils are similar to Dekalb soils except that they have a hardpan or fragipan in the lower part of the subsoil that impedes the movement of moisture through the soil. They are only moderately well drained and are seasonally wet and somewhat late to warm up in spring.

The most important less extensive soils in this association are in the Brinkerton, Cavode, Ernest, and Nolo series. The Brinkerton and Nolo soils are poorly drained, Cavode soils are somewhat poorly drained, and Ernest soils are moderately well drained.

All the minor soils need drainage for full use in farm-

*Figure 3.*—**Aerial view showing intensity of contour farming near Accident.**

ing. Although much of this association is cultivated, large areas are better suited to forage crops and pasture because of wetness and drainage problems, or because of the hazard of erosion on sloping to steep areas.

The dominant Gilpin and Dekalb soils have good drainage for building sites, but have limitations caused by depth over bedrock and by slope. Cookport soils and the important less extensive soils have limitations for building sites because of seasonal wetness, particularly for buildings with basements. Limitations for onsite sewage disposal by septic tanks are severe in most of this association because of subsoil wetness, slow movement of soil moisture through the subsoil, limited depth over bedrock, or slope.

### 3. *Gilpin-Wharton-Dekalb association*

*Gently sloping to steep, moderately deep and deep, well drained and moderately well drained soils; formed over acid, gray to brown, soft clay shale to hard sandstone*

This association occupies one area in the extreme northwestern part of the county. Most of the soils in this association are gently sloping to moderately sloping, but there are many steep areas where slopes are comparatively short.

This association occupies about 5 percent of the county. Gilpin soils make up about 45 percent of the association, Wharton soils about 17 percent, and Dekalb soils about 10 percent. Less extensive soils make up about 28 percent. Part of the association is very stony.

The soils in this association contain fewer hard rock fragments than those in associations 1 and 2. The major soils are grayish brown to yellowish brown. Gilpin and Dekalb soils are well drained and are 20 to 40 inches deep over hard shale or sandstone. Wharton soils are moderately well drained and are as much as 6 feet deep over soft clay shale. They have a subsoil of silty clay that is mottled with gray, is sticky and plastic, and is slowly permeable. Wharton soils are somewhat late to warm up in spring, and artificial drainage is needed in places for full use in farming.

Among the less extensive soils in this association are Armagh, Brinkerton, Cavode, and Cookport soils. Armagh and Brinkerton soils are poorly drained, Cavode soils are somewhat poorly drained, and Cookport soils are moderately well drained. All these soils need drainage for full use in farming.

In nearly half of this association the soils are seasonally wet, and more acreage is used for pasture and forage crops than for tilled crops. Much of the association is in woodland.

The Gilpin and Dekalb soils have good drainage for building sites, but have limitations caused by slope and depth to bedrock. Wharton soils and the less extensive soils have limitations for building sites because of seasonal wetness, particularly for buildings with basements. Limitations for sewage disposal by septic tanks are severe in most of this association. The main limitations are limited depth to bedrock, slow permeability, subsoil wetness, and slope.

### 4. *Lickdale-Armagh-Peat association*

*Nearly level to gently sloping, deep, poorly drained and very poorly drained soils; formed over acid clay shale to hard sandstone*

This association occupies one area in the central part of the county. Most of it is nearly level, but there are gentle slopes in places. The area is a shallow headwaters basin that is primarily drained by Cherry Creek but is drained in part by the North Branch of Casselman River. Some small areas are very stony.

This association occupies a little less than 1 percent of the county. Lickdale soils make up about 50 percent of the association, Armagh soils about 26 percent, Peat about 9 percent, and less extensive soils about 15 percent.

Lickdale soils are very poorly drained and have a black surface layer about 10 inches thick. Armagh soils are poorly drained and have a dark grayish-brown surface layer. Both Lickdale and Armagh soils have a mottled, gray, sticky subsoil. Peat is a miscellaneous land type that consists primarily of dark-brown peaty organic material. It has a thin, black, mucky surface layer. It is very poorly drained and in wet seasons tends to be ponded except where artificially drained.

The most important less extensive soils in this association are in the Gilpin, Cavode, and Brinkerton series. Gilpin soils are well drained and are moderately deep over bedrock. Cavode soils are somewhat poorly drained, Brinkerton soils are poorly drained, and both have a sticky, mottled subsoil.

Only a small acreage of this association is cultivated, because of natural drainage problems and because the Cavode and Brinkerton soils are difficult to till. Some of the Peat has been removed and marketed.

Except for some areas of less extensive soils, this association has severe limitations for building sites and for sewage disposal by septic tanks, primarily because of long periods of wetness. In addition, Peat is not satisfactory for building foundations, because it has poor bearing strength and shrinks and subsides when drained.

### 5. *Dekalb-Calvin-Gilpin association*

*Gently sloping to steep, moderately deep, well-drained, very stony soils; formed over acid, red to gray sandstone and shale*

This association occupies three areas in the county. The largest area consists of the greater part of the Savage River watershed in the east-central and northeastern parts of the county. Another area extends from near Swanton southwestward to the West Virginia line, chiefly on the western slopes of Backbone Mountain. The third area occupies the general area between Red Run Cove and Gap Run, in the west-central part of the county.

This association occupies about 14 percent of the county. Dekalb soils make up about 40 percent of the association, Calvin soils about 15 percent, Gilpin soils about 15 percent, and less extensive soils about 30 percent. The less extensive members are chiefly Lehew soils, Stony land, and Very stony land.

The Dekalb, Calvin, Gilpin, and Lehew soils are well drained and moderately deep and are very stony. Stony land is in steep areas and Very stony land is in sloping to very steep areas where the soil material is similar to that of the major soils but generally is less than 20 inches deep over bedrock. In places there are some large boulders and some outcroppings of hard rock.

Except for a small acreage, generally where some stones have been removed, this association is not used for cultivated crops. A small part of the association is used for forage crops and pasture, but most of it is used for woodland, wildlife habitat, watershed protection, and some kinds of outdoor recreation.

### 6. *Dekalb-Gilpin-Cookport association*

*Gently sloping to steep, moderately deep, well drained and moderately well drained, very stony soils; formed over acid, gray to yellowish sandstone and shale*

This association occupies two major areas in the county. One area consists primarily of the eastern slopes of Backbone Mountain and Big Savage Mountain along the entire eastern part of the county. The other area is irregular and extends over many parts of the county west of Hoop Pole Ridge and Meadow Mountain.

This association is the most extensive in the survey area; it occupies about 42 percent of the county. Dekalb soils make up about 35 percent of the association, Gilpin soils about 20 percent, and Cookport soils about 20 percent. Less extensive soils of the Ernest and Leetonia series and areas of Stony land and Very stony land make up about 25 percent. Cookport soils and Ernest soils are dominant in many of the less sloping parts of the association.

Dekalb, Gilpin, and Leetonia soils are very stony, well drained, and moderately deep. Cookport and Ernest soils are very stony and moderately well drained. Stony land is steep, and Very stony land is sloping to very steep. These land types have soil material similar to that of the major soils, but generally are less than 20 inches deep over bedrock.

Except in isolated areas, or where stones have been removed, this association is not used for cultivated crops. Small areas have been used for forage crops and pasture, but generally the association is used for woodland, wildlife habitat, watershed protection, and outdoor recreation.

## *Descriptions of the Soils*

This section describes the soil series and mapping units in Garrett County. Each soil series is described in considerable detail, and then, briefly, each mapping unit in that series. Unless specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second, detailed and in technical terms, is for scientists, engineers, and others who need to make thorough and precise studies of soils. Unless otherwise stated, the colors given in the descriptions are those of a moist soil.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Alluvial land, for example, does not belong to a soil series, but nevertheless, is listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and woodland group in which the mapping unit has been placed. The page for the description of each capability unit and woodland group can be found by referring to the "Guide to Mapping Units."

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary at the end of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*5*).[1]

[1] Italic numbers in parentheses refer to Literature Cited, p. 81.

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

| Soil | Area | Extent | Soil | Area | Extent |
|---|---|---|---|---|---|
| | *Acres* | *Percent* | | *Acres* | *Percent* |
| Albrights silt loam, 0 to 8 percent slopes | 4, 360 | 1. 0 | Dekalb and Gilpin very stony loams, 0 to 15 percent slopes | 23, 010 | 5. 4 |
| Albrights silt loam, 8 to 15 percent slopes, moderately eroded | 980 | . 2 | Dekalb and Gilpin very stony loams, 15 to 25 percent slopes | 41, 780 | 9. 9 |
| Albrights very stony silt loam, 0 to 15 percent slopes | 4, 200 | 1. 0 | Dekalb and Leetonia very stony sandy loams, 0 to 15 percent slopes | 15, 010 | 3. 6 |
| Allegheny fine sandy loam, 0 to 8 percent slopes | 120 | (1) | Dekalb and Leetonia very stony sandy loams, 15 to 25 percent slopes | 9, 310 | 2. 2 |
| Alluvial land | 1, 720 | . 4 | Elkins silt loam | 350 | . 1 |
| Alluvial land, very stony | 2, 610 | . 6 | Ernest silt loam, 0 to 3 percent slopes | 540 | . 1 |
| Armagh silt loam | 880 | . 2 | Ernest silt loam, 3 to 8 percent slopes | 5, 040 | 1. 2 |
| Atkins silt loam | 4, 970 | 1. 2 | Ernest silt loam, 8 to 15 percent slopes, moderately eroded | 2, 000 | . 5 |
| Brinkerton and Andover silt loams, 0 to 3 percent slopes | 6, 350 | 1. 5 | Ernest silt loam, 15 to 30 percent slopes, moderately eroded | 240 | . 1 |
| Brinkerton and Andover silt loams, 3 to 8 percent slopes | 2, 770 | . 7 | Gilpin channery silt loam, 0 to 10 percent slopes, moderately eroded | 18, 780 | 4. 4 |
| Brinkerton and Andover very stony silt loams, 0 to 15 percent slopes | 9, 290 | 2. 2 | Gilpin channery silt loam, 10 to 20 percent slopes, moderately eroded | 22, 150 | 5. 2 |
| Calvin-Gilpin-Ungers channery loams, 10 to 20 percent slopes, moderately eroded | 7, 830 | 1. 9 | Gilpin channery silt loam, 20 to 35 percent slopes, moderately eroded | 5, 060 | 1. 2 |
| Calvin-Gilpin-Ungers channery loams, 20 to 35 percent slopes, moderately eroded | 2, 720 | . 6 | Gilpin channery silt loam, 20 to 35 percent slopes, severely eroded | 1, 140 | . 3 |
| Calvin-Gilpin-Ungers channery loams, 20 to 35 percent slopes, severely eroded | 850 | . 2 | Laidig very stony loam, 0 to 8 percent slopes | 260 | . 1 |
| Calvin and Lehew channery loams, 35 to 50 percent slopes | 5, 200 | 1. 2 | Laidig very stony loam, 8 to 25 percent slopes | 1, 130 | . 3 |
| Calvin, Ungers and Lehew channery loams, 10 to 20 percent slopes, moderately eroded | 16, 570 | 3. 9 | Lickdale silt loam | 2, 450 | . 6 |
| Calvin, Ungers and Lehew channery loams, 20 to 35 percent slopes, moderately eroded | 5, 860 | 1. 4 | Lickdale very stony silt loam | 400 | . 1 |
| Calvin, Ungers and Lehew channery loams, 20 to 35 percent slopes, severely eroded | 1, 640 | . 4 | Meckesville silt loam, 0 to 8 percent slopes | 1, 090 | . 3 |
| Cavode silt loam, 0 to 8 percent slopes | 4, 100 | 1. 0 | Meckesville silt loam, 8 to 15 percent slopes, moderately eroded | 800 | . 2 |
| Cavode silt loam, 8 to 15 percent slopes, moderately eroded | 800 | . 2 | Meckesville very stony silt loam, 0 to 8 percent slopes | 780 | . 2 |
| Clymer channery loam, 0 to 10 percent slopes | 1, 470 | . 3 | Meckesville very stony silt loam, 8 to 25 percent slopes | 2, 680 | . 6 |
| Cookport channery loam, 0 to 8 percent slopes | 10, 650 | 2. 5 | Nolo silt loam, 0 to 8 percent slopes | 1, 480 | . 4 |
| Cookport channery loam, 8 to 15 percent slopes, moderately eroded | 1, 640 | . 4 | Peat | 400 | . 1 |
| Cookport and Ernest very stony silt loams, 0 to 8 percent slopes | 20, 670 | 4. 9 | Philo silt loam | 720 | . 2 |
| Cookport and Ernest very stony silt loams, 8 to 25 percent slopes | 22, 590 | 5. 3 | Pope silt loam | 450 | . 1 |
| Cut and fill land | 30 | (1) | Purdy silt loam, 0 to 15 percent slopes, moderately eroded | 300 | . 1 |
| Dekalb channery loam, 0 to 10 percent slopes | 6, 110 | 1. 4 | Stony land, steep | 69, 450 | 16. 4 |
| Dekalb channery loam, 10 to 20 percent slopes, moderately eroded | 3, 820 | . 9 | Strip mines and dumps | 3, 090 | . 7 |
| Dekalb channery loam, 20 to 35 percent slopes, moderately eroded | 550 | . 1 | Swamp | 930 | . 2 |
| Dekalb-Calvin-Lehew very stony loams, 0 to 15 percent slopes | 2, 880 | . 7 | Ungers, Calvin and Lehew channery loams, 0 to 10 percent slopes | 10, 500 | 2. 5 |
| Dekalb-Calvin-Lehew very stony loams, 15 to 25 percent slopes | 10, 300 | 2. 4 | Ungers-Gilpin-Calvin channery loams, 0 to 10 percent slopes | 5, 630 | 1. 3 |
| | | | Very stony land, rolling | 7, 920 | 1. 9 |
| | | | Very stony land, steep | 1, 480 | . 3 |
| | | | Wharton silt loam, 0 to 10 percent slopes, moderately eroded | 1, 860 | . 4 |
| | | | Wharton silt loam, 10 to 20 percent slopes, moderately eroded | 940 | . 2 |
| | | | Total | 423, 680 | 100. 0 |

[1] Less than 0.05 percent.

## Albrights Series

The Albrights series consists of deep, somewhat poorly drained to moderately well drained soils that have a fragipan in the lower part of the subsoil. These soils are on foot slopes. They formed in local colluvial accumulations of debris from reddish shale and sandstone. The native vegetation is mixed hardwoods, dominantly oak and maple trees that tolerate at least seasonal wetness.

In a representative profile the surface layer is reddish-brown silt loam about 10 inches thick. The subsoil, about 34 inches thick, is reddish-brown, sticky clay loam in the upper part. The lower part is a fragipan of reddish-brown loam to clay loam that is mottled with grayish colors and is dense, firm, and brittle. Water moves moderately slowly through this layer. Below the fragipan is stratified colluvial material that extends to a depth of about 5 feet.

The Albrights soils are fairly easy to work, except where the surface layer is too stony. However, these soils tend to be wet in spring and are slow to warm up. Planting is frequently delayed. Artificial drainage is needed in places for common cultivated crops and for some other uses. Although seasonally wet, Albrights soils have only moderate available moisture capacity. This is because few roots penetrate into the fragipan in the lower part of the subsoil, and most roots are confined to the upper 12 to 18 inches of the soil. Because moisture moves moderately slowly through the fragipan, these soils tend to dry out more quickly in dry weather than do more permeable and porous soils. Albrights soils are limited for some uses by impeded drainage and a seasonally perched water table, by rather slow movement of moisture through the subsoil, by slope and the hazard of erosion, and locally by stoniness.

Representative profile of Albrights silt loam, 0 to 8 percent slopes, in a pasture on Boy Scout Road, about 1 mile northeast of its intersection with Penn Point Road:

Ap—0 to 10 inches, reddish-brown (5YR 4/4) silt loam; weak, fine, granular structure; friable, slightly sticky; many roots; medium acid (limed); clear, smooth boundary.

B2t—10 to 18 inches, reddish-brown (5YR 5/3) clay loam; few, fine, faint mottles of pinkish gray (5YR 6/2) and yellowish brown (10YR 5/4); moderate, medium, subangular blocky structure; friable, sticky and slightly plastic; common roots; thin discontinuous clay films; strongly acid; clear, wavy boundary.

Bx1—18 to 33 inches, reddish-brown (5YR 5/3) clay loam; common, medium, distinct mottles of strong brown (7.5YR 5/8) and gray or light gray (10YR 6/1); moderate, coarse, prismatic and thin, platy structure; very firm and brittle, sticky and plastic; very few roots; prominent grayish-brown (10YR 5/2) to yellowish-brown (10YR 5/4) clay films, especially between plates; strongly acid; gradual, wavy boundary.

Bx2—33 to 44 inches, reddish-brown (5YR 5/3) loam that grades to sandy loam; common, medium, distinct mottles of strong brown (7.5YR 5/6) and gray (10YR 5/1); moderate, coarse, prismatic and thin, platy structure; firm and brittle, slightly sticky and slightly plastic; grayish-brown (10YR 5/2) clay films between aggregates; strongly acid; gradual, irregular boundary.

C—44 to 60 inches, brown (7.5YR 5/4) stratified sandy loam and clay loam; common, coarse, prominent mottles of reddish yellow (7.5YR 6/8) and a few, fine, faint mottles of gray or light gray (10YR 6/1); friable to firm; clay loam part is sticky; medium acid.

The solum ranges from 40 to 50 inches or more in thickness. Unconforming bedrock is at depths greater than 6 feet. In places, the content of coarse fragments smaller than stones is as much as 10 percent in the A horizon, 25 percent in the B horizon, and more than 50 percent in the C horizon. Colluvial stones are scattered on and near the soil surface, and some areas are very stony. Unlimed soils are strongly acid to medium acid. The C horizon tends to be less strongly acid than the solum.

In the A horizon, hue is 5YR or 7.5YR, value is 3 to 5, and chroma is 1 to 4. Value of 3 and chroma of 1 are limited to the A1 horizon of undisturbed soils in wooded areas. In many places the A horizon is distinctly gritty.

In the B horizon, the matrix hue is 5YR or 2.5YR, value is 3 to 5, and chroma is 3 to 6. There is mottling with chromas of 2 or less in the Bx horizons, and also in the B2t horizon of some profiles. The B horizon ranges from loam to clay loam or silty clay loam. The content of clay in the upper 20 inches of the B horizon averages between 18 and 35 percent.

The C horizon is similar in color to the lower part of the B horizon but tends to be yellower in matrix hue. It varies in texture and is mixed or stratified in many places.

Albrights soils resemble Ernest and Cookport soils in drainage and in having a fragipan in the lower part of the subsoil. They are redder throughout than either Ernest or Cookport soils, and the Cookport soils are commonly less than 40 inches deep over bedrock. They are not so well drained as Meckesville soils, which have reddish subsoil colors but do not have gray mottles in the subsoil within 30 inches of the surface.

**Albrights silt loam, 0 to 8 percent slopes** (AbB).—This soil has the profile described as representative of the Albrights series. Artificial drainage benefits some crops and some other uses, particularly in the more nearly level areas. The most important concern in management for most uses is the moderate hazard of erosion. Some small scattered areas have already lost a moderate amount of surface soil, mostly through scouring by runoff water from other soil areas. In some spots soil material has accumulated on the surface as a result of erosion or washing from other areas. There are a few gullies; most are shallow. Capability unit IIe–13; woodland group 3w1.

**Albrights silt loam, 8 to 15 percent slopes, moderately eroded** (AbC2).—Because this soil is moderately sloping, part of the silt loam surface layer has been lost through erosion in most areas. In many places, plowing to normal depth mixes part of the sticky subsoil material into the plow layer, and that layer becomes more sticky and cloddy.

Included in mapping are woodland areas where the soil is only slightly eroded. Also included are areas where slopes are slightly more than 15 percent.

The hazard of continued erosion is severe on this soil. In a few areas erosion has already been severe enough to expose the subsoil and to cause shallow gullies that extend into the subsoil. Capability unit IIIe–13; woodland group 3w1.

**Albrights very stony silt loam, 0 to 15 percent slopes** (AgC).—Except for the presence of stones, this soil has a profile similar to that described as representative of the series. There are angular to subangular stones, mainly of reddish sandstone, in sufficient quantity on and near the surface to make tillage of row crops impracticable. These stones are mostly larger than 10 inches in diameter, and are most commonly 5 to 30 feet apart, though local spots are either more or less stony.

This soil can be used for improved pasture or locally for hay crops, for which some stone removal is beneficial. There are few limitations for wood crop production. Practically all areas of this soil are now in woodland

cover. Some areas that have been cleared for other uses are reverting to woodland. Capability unit VIs–3; woodland group 3w1.

## Allegheny Series

The Allegheny series consists of deep, well-drained soils on high terraces above major streams. The native vegetation is mixed hardwoods, but almost all areas have been cleared for use.

In a representative profile the surface layer is dark grayish-brown to very dark grayish-brown fine sandy loam in the upper 3 inches and dark-brown loam or fine sandy loam in the lower 7 inches. The subsoil, about 17 inches thick, is brown to dark-brown loam to silty clay loam that is slightly sticky. The underlying material is strong-brown sandy loam that contains many pebbles or gravel fragments.

The Allegheny soils are easy to work. Moisture moves readily through them and the available moisture capacity generally is high. These soils are well suited to crops under good management, and are among the better farming soils in the county. They are limited for crops and for most other uses only by slope and the hazard of erosion.

Representative profile of Allegheny fine sandy loam, 0 to 8 percent slopes, in a wooded area on a terrace above the Youghiogheny River, about one-fourth mile north of Sang Run:

A11—0 to 1 inch, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, fine, granular structure; very friable; many roots; very strongly acid; abrupt, smooth boundary.

A12—1 to 3 inches, dark yellowish-brown (10YR 3/4) fine sandy loam; moderate, medium to coarse, granular structure; friable; many roots; very strongly acid; clear, smooth boundary.

A2—3 to 10 inches, dark-brown (7.5YR 4/4) loam to fine sandy loam; weak, fine and medium, subangular blocky structure; friable; common roots; very strongly acid; gradual, smooth boundary.

B21t—10 to 18 inches, dark-brown (7.5YR 4/4) silty clay loam; weak to moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; common roots; thin clay films; strongly acid; gradual, smooth boundary.

B22t—18 to 27 inches, brown (7.5YR 5/4) loam; weak to moderate, medium, subangular blocky structure; friable; slightly sticky; common roots; faint, patchy clay films; strongly acid; gradual, smooth boundary.

IIC—27 to 60 inches, strong-brown (7.5YR 5/6) gravelly sandy loam; single grain; friable to firm; very few roots; some small nodules of clay loam; about 20 percent partly weathered pebbles of very pale brown (10YR 7/3) sandstone; strongly acid.

The solum normally ranges from 30 to 40 inches in thickness, but in Garrett County the solum commonly is less than 30 inches thick. Unconforming bedrock is at depths greater than 5 feet. Pebbles are in all horizons in places, but are common only in the IIC horizon. Unlimed soils are strongly acid to very strongly acid, or extremely acid in the IIC horizon.

Throughout the solum, hue is 10YR or 7.5YR. In the A horizon value is 3 to 5 and chroma is 2 to 4. Value of 3 is limited to the thin A1 horizon of undisturbed soils in wooded areas. In the B horizon color value is 4 or 5 and chroma is 4 or 6. The B horizon is loam or clay loam in texture, but ranges to silty clay loam in places. It is between 18 and 35 percent clay.

The C horizon is variable in color, and in places is mottled or variegated. It is sandy loam to sandy clay loam, and ranges to as much as 30 percent in gravel content.

Allegheny soils resemble Clymer and Gilpin soils, but they are deeper over bedrock. They contain less sand in the B horizon than Clymer soils and less silt in the B horizon than Gilpin soils.

**Allegheny fine sandy loam, 0 to 8 percent slopes** (AhB).—Where this soil is cultivated, the plow layer is dark brown to dark grayish brown. Because of the slope, there is a moderate hazard of erosion, and this hazard is almost the only concern that affects use and management.

Included in mapping are areas where this soil has been moderately eroded, but these areas are not large enough to affect use for farming. Also included are a few small areas where the surface or plow layer is somewhat more silty and less sandy than described, and some scattered spots where slopes are slightly more than 8 percent.

This soil is well suited to most crops grown in the county. Capability unit IIe–5; woodland group 2o1.

## Alluvial Land

Alluvial land is made up of soils that formed in mixed, variable material on flood plains. Most areas are along small streams in narrow V-shaped or U-shaped valleys. Slope ranges mostly from about 3 to 8 percent, but in some of the broader areas the soils are more nearly level. The soil material was washed from upland areas and ranges from sand to clay in texture. In some places it contains angular, subangular, and rounded gravel, and in others it is very stony. The native vegetation is willows, alders, and other wetland trees and shrubs.

Most of this land type is poorly drained, but in places it is well drained. It is mostly wet in wet seasons and variably wet in dry seasons. Nearly all of the acreage is fairly frequently flooded. Floods are usually of short duration, but the floodwaters have considerable velocity. There is little or no orderly sedimentation from swiftly flowing floodwaters, and there is much movement and mixing of soil particles and rock fragments of all sizes.

**Alluvial land** (An) consists of those parts of Alluvial land that are not stony enough to significantly affect land use. This land is not suited to tillage, primarily because of the flood hazard. Most of the acreage is in tree or shrub cover, but some areas are suited to pasture. This land type generally is used mostly for wildlife habitat (fig. 4) and for outdoor recreation. Capability unit VIw–1; woodland group 2w3.

*Figure 4.*—**Alluvial land on the North Branch of Casselman River. Beaver have created a temporary trout pond.**

**Alluvial land, very stony** (Ao) consists of those areas of Alluvial land that are very stony to bouldery, particularly on the surface. Gravel of all sizes and stones larger than 10 inches in size are abundant, and tillage is not practical. Little if any of this soil is used for farming. Some areas are fairly well wooded. Others are nearly barren of vegetation larger than shrubs. Limitations are severe for all uses except for wildlife habitat. Capability unit VIIs–4; woodland group 2w3.

## Andover Series

The Andover series consists of deep, poorly drained soils that have a firm, brittle fragipan in the lower part of the subsoil. These soils are in draws and on foot slopes where they formed in colluvial debris dominated by sandstone. The native vegetation consists of water-tolerant hardwoods; hemlock and white pine grow in places.

In a representative profile the surface layer is dark grayish-brown silt loam in the upper 8 inches and dark-gray silt loam in the lower 3 inches. The subsoil, about 27 inches thick, is sandy clay loam that is dark grayish brown in the upper part, pinkish gray in the middle part, and pink in the lower part, where it is distinctly firm and brittle. The underlying material to a depth of 5 feet or more is a variable mass of sandstone fragments mixed with fine soil.

If these soils are neither too wet nor too dry, they are easy to work except where the surface layer is too stony. They are wet for long periods, however, especially in spring. Artificial drainage is needed for tilled crops and is also beneficial for hay crops and pasture. These soils have moderate available moisture capacity, but moisture moves slowly through the subsoil and in dry weather they tend to dry out completely in the upper part of the profile. Andover soils are limited in use by poor drainage and a seasonally perched water table, by slow movement of moisture through the subsoil, and locally by slope or stoniness or both.

Representative profile of Andover silt loam, in a cultivated area of Brinkerton and Andover silt loams, 0 to 3 percent slopes, about one-fourth mile north of the intersection of Cove Road and Devils-Half-Acre Road:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) light silt loam; weak, fine, granular structure; very friable; common roots; a few, small, flat sandstone fragments; slightly acid (limed); clear, smooth boundary.

A2g—8 to 11 inches, dark-gray (10YR 4/1) light silt loam; few, fine, faint mottles of dark brown (7.5YR 4/4); weak, fine, granular to very fine subangular blocky structure; friable; common roots; a few, small, flat sandstone fragments; slightly acid; abrupt, wavy boundary.

B21tg—11 to 17 inches, dark grayish-brown (10YR 4/2) sandy clay loam; few, medium, faint mottles of brown (10YR 5/3) and common, medium, prominent mottles of yellowish brown (10YR 5/8); moderate, fine, subangular blocky structure; friable, sticky and plastic; common roots; grayish-brown (10YR 5/2), thin, patchy clay films; a few sandstone fragments; medium acid; clear, wavy boundary.

B22tg—17 to 24 inches, pinkish-gray (5YR 6/2) sandy clay loam; common, medium, prominent mottles of red (2.5YR 4/6) and yellowish red (5YR 5/8); moderate to strong, medium, blocky structure; friable to firm, sticky and plastic; very few roots; thin continuous clay films; some fine sandstone fragments; medium acid; clear, wavy boundary.

Bx—24 to 38 inches, pink (5YR 7/3) loam or light sandy clay loam; common, coarse, distinct mottles of pinkish gray (5YR 6/2), reddish brown (5YR 4/4), and yellowish brown (10YR 5/6); moderate to strong, medium, platy structure; very firm, brittle, sticky and plastic; thick but discontinuous clay films or flows; many fine sandstone fragments; strongly acid; clear, wavy boundary.

C—38 to 60 inches, variegated brown (10YR 5/3) to red (2.5YR 4/6) gravelly loam; massive; friable to firm, slightly sticky; about 50 percent sandstone fragments; strongly acid.

The solum normally is 40 to 55 inches in thickness, but in Garrett County the solum is commonly less than 40 inches thick. Unconforming bedrock is at depths greater than 6 feet. Content of coarse fragments smaller than stones ranges from about 0 to about 10 percent in the A horizon, 0 to about 20 percent in the B horizon, and 10 to 60 percent in the C horizon. Colluvial stones are scattered on and near the surface, and some areas are very stony. Unlimed soils are strongly acid to very strongly acid, and acidity commonly increases with increasing depth.

In the A horizon hue is 10YR or 2.5Y, value is 2 to 4, and chroma is 1 or 2. Value of 2 or 3 is limited to the A1 horizon of undisturbed soils in wooded areas. In some profiles the A2 horizon is loam.

In the B horizon, matrix hue is commonly 10YR or 2.5Y, but where the colluvial material in which the soils formed Content of coarse fragments smaller than stones ranges from lower part of the B horizon is 5YR. This is redder than the normal range in hue for Andover soils in many survey areas. In the B horizon, matrix value is 4 to 7, and chroma is 1 to 3. Value of 7 and chroma of 3 occur only in hue 5YR. Mottles range in hue from 10YR to 2.5YR, value is 4 to 6, and chroma 3 to 8. The B horizon is loam, clay loam, or sandy clay loam. It averages about 18 to 27 percent in clay content.

The C horizon is highly variable and commonly mixed in color. The C horizon is gravelly loam or gravelly sandy loam.

Andover soils resemble Brinkerton, Nolo, and Laidig soils. They have a coarser textured subsoil than that of Brinkerton soils, and are deeper over bedrock than Nolo soils, which formed in residuum on uplands. They formed in colluvial material similar to that in which the well-drained Laidig soils formed.

Andover soils are not mapped separately in Garrett County. They are mapped only with Brinkerton soils.

## Armagh Series

The Armagh series consists of deep, poorly drained soils on uplands. These soils formed in material weathered from soft, fine-grained shale. The native vegetation is mainly wetland hardwoods, although some areas support wetland shrubs and grasses.

In a representative profile the surface layer is dark grayish-brown silt loam in the upper 5 inches, and gray silt loam, mottled with yellowish brown, in the lower 6 inches. The subsoil, about 18 inches thick, is gray or light-gray, sticky, silty clay loam that is strongly mottled with brown and reddish colors. The underlying material is light-gray, mottled, shaly silty clay loam. Clay shale bedrock begins at a depth of about 44 inches.

Armagh soils are commonly difficult to work because only the upper few inches is friable under the most favorable moisture conditions. If the soil is slightly too dry, it is hard; if it is only slightly too wet, it is sticky, plastic, and intractable and forms clods after plowing. These are cold soils that are late to warm up in spring. Water moves sowly through the subsoil. Artificial drainage is needed for Armagh soils if they are to be intensively used for any purpose. Artificial drainage is difficult, and not very efficient in wet seasons. Open ditches generally func-

tion better than tile drains. Wetness, poor natural drainage, and the difficulty of drainage and tillage severely limit these soils for farming and for most other purposes.

Representative profile of Armagh silt loam, in a nearly level, drained, and cultivated area on Route 495, about one-fourth mile north of Bittinger:

Ap—0 to 5 inches, dark grayish-brown (2.5Y 4/2) silt loam; moderate, medium, granular structure; friable to firm, sticky and plastic; many roots; neutral (limed); abrupt, smooth boundary.

A2g—5 to 11 inches, gray (10YR 5/1) silt loam; common, medium, prominent mottles of yellowish brown (10YR 5/8); moderate, medium, blocky and subangular blocky structure; firm, sticky and plastic; many roots; medium acid; clear, smooth boundary.

B21tg—11 to 20 inches, gray or light-gray (10YR 6/1) heavy silty clay loam; common, medium, prominent mottles of yellowish brown (10YR 5/8) and strong brown (7.5YR 5/6); moderate, medium, blocky and subangular blocky structure; firm, sticky and plastic; many roots in upper part; thin discontinuous clay films; a few weak concretions; strongly acid; clear, smooth boundary.

B22tg—20 to 29 inches, gray or light-gray (10YR 6/1) heavy silty clay loam; common, medium, prominent mottles of strong brown (7.5YR 5/8) and yellowish red (5YR 5/8); moderate, fine, subangular blocky structure; friable to firm, sticky and plastic; very few roots; patchy clay films; a few, fine, black concretions and some disintegrated shale fragments; very strongly acid; abrupt, wavy boundary.

Cg—29 to 44 inches, light-gray (10YR 7/1) shaly silty clay loam; common, coarse, prominent mottles of strong brown (7.5YR 5/6) and yellowish red (5YR 5/6); massive; firm, sticky and plastic; about 60 percent very soft shale fragments; very strongly acid; abrupt, irregular boundary.

R—44 inches +, light-gray (10YR 7/1) clay shale that has some thin seams of sandstone.

The solum commonly ranges from 26 to 40 inches in thickness. The depth to bedrock ranges from about 3½ feet to 6 feet. Soft shale fragments are in the B horizon of some profiles, and are commonly abundant in the C horizon. Unlimed soils are strongly acid to extremely acid, and acidity commonly increases with increasing depth.

Throughout the profile the matrix color is 10YR or yellower in hue, and ranges to neutral. In the A horizon, value is 2 to 5 and chroma is 1 or 2. Value of 2 or 3 is limited to the thin A1 horizon of undisturbed soils in wooded areas. The silt loam A horizon is definitely more firm, more sticky, and more plastic than most silt loams in Garrett County.

In the B horizon, matrix value is 5 to 7 and the matrix chroma is 0 or 1. Mottling is in hue 10YR to 5YR, with a value commonly of 5 and a chroma of 4 to 8. Clay films are gray. The B horizon is commonly heavy silty clay loam, but ranges to silty clay or clay. The B horizon averages a little more than 35 percent in clay content.

The C horizon has about the same range in color as the B horizon. The clay content of the C horizon is lower than that of the B horizon. In most soils the C horizon is shaly or very shaly.

Armagh soils resemble Atkins and Purdy soils in color and in natural drainage. They have a finer textured, more slowly permeable subsoil than Atkins soils on flood plains. They contain less clay in the subsoil and are less deep over bedrock than Purdy soils on old stream terraces. They formed in the same kind of soft clay shale material as the moderately well drained Wharton soils and the somewhat poorly drained Cavode soils.

**Armagh silt loam** (Ar).—In most areas this soil is nearly level, but in about one-fifth of the total acreage slopes are a little more than 3 percent.

This soil is generally poorly suited to tilled crops, even if drainage is improved. Because water moves so slowly through the subsoil, ditches generally are more effective than tile in improving drainage. Even with drainage installed, wetness generally continues late into spring. The soil is suited to hay crops or pasture, although most undrained areas remain in woodland cover. Some areas have been affected by surface wash or scouring caused by runoff waters from adjacent soils at higher elevations. Capability unit IVw–2; woodland group 1w2.

## Atkins Series

The Atkins series consists of deep, poorly drained soils on flood plains. These soils formed in recent sediment washed from areas of acid rock and soil. The native vegetation is mainly wetland hardwoods and some hemlock trees.

In a representative profile the surface layer is dark-gray silt loam about 7 inches thick. The subsoil, about 37 inches thick, is gray to dark-gray silty clay loam that is mottled with yellowish brown. The underlying material is gray, mottled, stratified fine sandy loam.

Atkins soils are fairly easy to work, but generally are too wet to work until late in spring. Plowing and planting usually are delayed. These soils are subject to flooding, and frequently are flooded after heavy rains or sudden thaws. Artificial drainage is needed for intensive use, and increases the grazing period for pasture. The soil is reasonably easy to drain, wherever adequate outlets are available. Water moves moderately slowly through the soil. Wetness, poor natural drainage, and the hazard of flooding severely limit the use of the soil for farming, and even more severely limit its use for many nonfarm purposes.

Representative profile of Atkins silt loam, in a nearly level, cultivated area on Silver Knob Road, about three-fourths of a mile from its intersection with U.S. 219:

Ap—0 to 7 inches, dark-gray (10YR 4/1) silt loam; weak, fine, granular structure; friable, slightly sticky; many roots; slightly acid (limed); clear, smooth boundary.

B1g—7 to 22 inches, gray (10YR 5/1) silty clay loam; few, fine, distinct mottles of yellowish brown (10YR 5/6); weak, medium, blocky structure; firm, sticky and plastic; many roots in upper part; very dark grayish-brown (10YR 3/2) silty material in old root channels; medium acid; clear, wavy boundary.

B2g—22 to 44 inches, dark-gray (10YR 4/1) light silty clay loam; few, medium, distinct mottles of yellowish brown (10YR 5/6); moderate, medium, blocky structure; friable to firm, sticky and plastic; very few roots; dark-brown (7.5YR 3/2) stains in old root channels; medium acid; abrupt, smooth boundary.

IICg—44 to 60 inches, gray (10YR 5/1) fine sandy loam; few, fine, distinct mottles of yellowish brown (10YR 5/6); stratified; friable to firm, slightly sticky; very strongly acid.

The solum ranges from about 40 to 50 inches in thickness. The depth to unconforming bedrock is at least 6 feet and commonly more. Waterworn pebbles are in all horizons, but are common only in the IIC horizon. Unlimed soils are strongly acid to very strongly acid, and acidity commonly increases with increasing depth.

Throughout the profile matrix color is 10YR or yellower in hue, and ranges to neutral. In the A horizon, value is 3 to 7 and chroma is 1 to 4. Value of 3 is limited to the thin A1 horizon of undisturbed soils in wooded areas.

In the B horizon, matrix value is 4 to 7 and matrix chroma is 0, 1, or 2. Mottling is commonly in hue 10YR or 7.5YR, but in a few places is redder or yellower in hue and has a value of 4 or 5 and a chroma of 2 to 8. This B horizon is silt loam or silty clay loam, but any difference in texture within this horizon is due to differential sedimentation and not to any significant movement of fine material within the soil profile.

The C horizon is variable in color, but is dominantly gray and mottled like the B horizon. Some soils have a C horizon similar in texture to the B horizon, but most profiles have the unconforming IIC horizon, which is abruptly coarser in texture than the B horizon.

No other soils were mapped in Garrett County that are closely similar to the Atkins soil. Atkins soils resemble Armagh and Purdy soils in color and in natural drainage, but have a coarser textured, more permeable subsoil. They formed in recent sediment similar to the parent material of the well drained Pope soils, the moderately well drained Philo soils, and the very poorly drained Elkins soils that have a thick, black or nearly black A horizon.

**Atkins silt loam** (At).—This soil occupies most of the small or narrow flood plains of the county, except those where soil materials are so mixed that they have been classified simply as Alluvial land. Atkins silt loam occupies many of the lower areas and depressions within broader flood plains, especially where these are not near or adjacent to stream channels. In most areas this soil is nearly level, but there are a number of acres where slopes are gentle.

If artificially drained and sufficiently protected against flooding, this soil can be used for corn, hay crops, and pasture. Where the hazard of flooding is severe, cropping is severely limited, and where the hazard of flooding is very severe, use of the soil is limited mainly to woodland or seasonal grazing. The hazard and frequency of flooding vary from area to area on this soil. Capability unit IIIw–7; woodland group 1w2.

## Brinkerton Series

The Brinkerton series consists of deep, poorly drained soils that have a fragipan in the lower part of the subsoil. These soils are in upland draws and on flats where they formed partly in material weathered from underlying fine-textured shale and partly in local alluvium or colluvium. There is no clear distinction in the profile between the different parent materials. The native vegetation is water-tolerant hardwoods and some hemlock and white pine.

In a representative profile the surface layer is dark-gray silt loam about 9 inches thick. The upper part of the subsoil, about 21 inches thick, is gray or dark-gray silty clay loam that is sticky and plastic and mottled with brown to red colors. The lower part of the subsoil is a gray silty clay loam fragipan that is mottled, firm, and brittle to a depth of more than 5 feet.

Brinkerton soils are difficult to work. They are hard if too dry and are somewhat sticky and intractable if too wet. Very stony areas are not workable by modern farming methods. These soils are wet for long periods in spring. Artificial drainage is needed for tilled crops and is also beneficial for hay crops and pasture. Brinkerton soils have high available moisture capacity and generally are well supplied with plant nutrients. Water moves slowly through the subsoil, and drainage is slow and difficult. Sloping areas are subject to erosion.

Representative profile of Brinkerton silt loam, in a cultivated area of Brinkerton and Andover silt loams, 3 to 8 percent slopes, on Rock Ledge Road, near Mosser Road:

Ap—0 to 9 inches, dark-gray (10YR 4/1) silt loam that has flecks or stains of yellowish red (5YR 5/6); weak, fine and medium, granular structure; friable, slightly sticky and slightly plastic; many roots; slightly acid; abrupt, smooth boundary.

B1g—9 to 19 inches, dark-gray (10YR 4/1) silty clay loam; few, medium, distinct mottles of yellowish red (5YR 5/6) and prominent mottles of dark red (2.5YR 3/6); moderate, medium, blocky structure; firm, sticky and plastic; many roots; some very faint clay films; strongly acid; clear, wavy boundary.

B2tg—19 to 30 inches, gray (10YR 5/1) heavy silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6); moderate, medium, blocky structure; firm, sticky and plastic; very few roots; prominent clay films; medium acid; clear, wavy boundary.

Bx—30 to 50 inches, gray (10YR 5/1) light silty clay loam; common, coarse, prominent mottles of yellowish red (5YR 4/6); moderate to strong, thick, platy structure; very firm, brittle, plastic and very sticky; prominent clay films between some plates; slightly acid.

The solum ranges from about 40 to 50 inches in thickness. The depth to bedrock is commonly more than 6 feet. Normally, there are few if any coarse fragments smaller than stones. Colluvial stones are scattered on and near the surface, and many areas are very stony. Unlimed soils are slightly acid to very strongly acid, and acidity commonly decreases with increasing depth.

Throughout the profile, matrix color is 10YR or yellower in hue. In the A horizon, value is 2 to 4 and chroma is 1 to 3. Value of 2 or 3 is limited to the thin A1 horizon of undisturbed soils in wooded areas.

In the B horizon, matrix value is 4 to 6, and chroma is 1 or 2. Mottling is in hue 10YR to 2.5YR, a value of 3 to 5 and a chroma of 3 to 8. The B horizon ranges from loam to silty clay loam. The upper 20 inches of the B horizon is 30 to 35 percent clay and 50 to 65 percent silt.

Brinkerton soils resemble Andover and Nolo soils, but have a finer textured B horizon and are less strongly acid.

In Garrett County, Brinkerton soils are mapped only with Andover soils. In any given area, the soil may be of either series, but the soils of both series seldom occur within the same delineation. The soils of the two series generally have the same uses, capabilities, and limitations.

**Brinkerton and Andover silt loams, 0 to 3 percent slopes** (BrA).—The Andover soil in this mapping unit has the profile described as representative of the Andover series. Poor natural drainage is the most important concern affecting use and management of these soils. Water moves slowly through the lower part of the subsoil, and runoff is slow because the soils are so nearly level. Intensive and very well maintained artificial drainage is necessary for tilled crops. These soils more commonly are used for hay and pasture or for woodland and wildlife habitat. In places there is surface washing or scouring and in some depressions there are accumulations of soil material that washed from other areas. Capability unit IVw–2; woodland group 2w2.

**Brinkerton and Andover silt loams, 3 to 8 percent slopes** (BrB).—The Brinkerton soil in this unit has the profile described as representative of the series These soils slope enough that there is fairly good surface drainage, but the slope also causes a hazard of erosion. Poor internal drainage affects use and management. Movement of water through the soil is slow. Intensive drainage improvement and maintenance is required for tilled crops. Some areas of these soils are dissected by intermittent drainageways. These hinder some operations, but generally are the best available drainage system outlets.

Included with these soils in mapping are soils that have lost some surface soil through erosion, and there are spots of soil accumulation. Also included in mapping are some small areas that slope more than 8 percent.

These soils are suited to hay, pasture, woodland, and wildlife habitat. Capability unit IVw–2; woodland group 2w2.

**Brinkerton and Andover very stony silt loams, 0 to 15 percent slopes** (BsC).—Stones and boulders more than 10 inches in diameter are common on and near the surface of these soils; they cover 3 percent or more of the surface area. Except for the stones, the profiles are similar to those described for the Brinkerton and the Andover series.

Included with these soils in mapping are small stony areas of soils that are similar to the Armagh and the Nolo soils. Also included are small areas where slopes are more than 15 percent.

Stoniness and poor internal drainage effectively prevent tillage by modern methods. These soils are little used for farming, but they are suitable for woodland and for wildlife habitat. Capability unit VIIs–4; woodland group 2w2.

## Calvin Series

The Calvin series consists of moderately deep, well-drained soils on uplands. These soils formed in material weathered from reddish shale, siltstone, and fine-grained sandstone. The native vegetation is mixed upland hardwoods, mainly oak and maple, and some Virginia pine and white pine.

In a representative profile the surface layer is reddish-brown channery loam about 10 inches thick. The subsoil, about 8 inches thick, is dark reddish-brown, friable channery silt loam. The underlying material is weak-red very channery and shaly loam that extends to shale bedrock at a depth of about 2 feet.

The Calvin soils are easy to work, but coarse fragments in the soil are abrasive to farm implements. These soils have low available moisture capacity and tend to dry deeply during prolonged dry weather. Permeability is moderately rapid. The chief limitations to use of nonstony Calvin soils are low available moisture capacity, slope, and hazard of erosion. The Calvin soils have limitations for many nonfarm uses because they are only moderately deep over bedrock.

Representative profile of a Calvin channery loam, in a cultivated area of Ungers, Calvin and Lehew channery loams, 0 to 10 percent slopes, about one-fourth mile north of the road between Friendsville and Accident and 2 miles west of Accident:

Ap—0 to 10 inches, reddish-brown (5YR 4/3) channery loam to silt loam; moderate, medium, granular structure; friable; many roots; slightly acid (limed); abrupt, smooth boundary.

B2—10 to 18 inches, dark reddish-brown (2.5YR 3/4) channery light silt loam; moderate, fine, subangular blocky structure; friable; many roots; about 25 percent flat sandstone fragments; strongly acid; abrupt, wavy boundary.

C—18 to 24 inches, weak-red (2.5YR 4/2) very channery and very shaly loam; inherent rock structure; friable; few roots; about 50 percent coarse fragments coated with silt or clay; very strongly acid; clear, wavy boundary.

R—24 inches +, reddish-brown (2.5YR 4/4) fractured and partly weathered but mostly unbroken shale.

The solum is commonly less than 20 inches thick. The depth to bedrock ranges from 20 to 40 inches. Coarse fragments smaller than stones make up 15 to 50 percent of the A and B horizons and are commonly more abundant in the C horizon. The average content of coarse fragments in the profile is more than 35 percent. Some areas of Calvin soils are very stony. Unlimed soils are strongly acid to very strongly acid, and acidity commonly increases with increasing depth.

In the A horizon hue is 5YR or 7.5YR, value is 3 or 4, and chroma is 2 to 4. Value of 2 or 3 is limited to the thin A1 horizon of undisturbed profiles in wooded areas.

In the B horizon hue ranges from 5YR to 10YR, value is 3 to 5, and chroma is 3 to 6. The fine material in the B horizon is loam or silt loam. The content of clay in the A and B horizons combined ranges from about 18 to 25 percent.

The C horizon is similar to the B horizon in color, except that chroma is commonly 2 to 4. Chroma of 2 is inherent and is not caused by impeded drainage, aeration, or organic matter. The fine material in the C horizon is loam or silt loam. The C horizon is very channery, very shaly, or both.

Other dominantly reddish soils of the county are those of the Albrights, Lehew, Meckesville, and Ungers series. Calvin soils have a less clayey and less sticky B horizon than Ungers soils, and a less sandy B and C horizon than Lehew soils. They do not have a fragipan in the lower part of the subsoil, as do Albrights and Meckesville soils, and they are better drained than Albrights soils.

The Calvin soils in Garrett County are mapped with Gilpin, Ungers, Lehew, and Dekalb soils.

**Calvin-Gilpin-Ungers channery loams, 10 to 20 percent slopes, moderately eroded** (CaC2).—The soils of this complex differ from each other in some important characteristics but have about the same suitability and limitations for use. In general, they are complexly intermingled on the landscape, and any delineation on the map commonly includes all three kinds of soil. The Calvin soil makes up about 60 percent of the complex, the Gilpin soil about 25 percent, and the Ungers soil about 15 percent.

These soils are moderately deep to deep over bedrock and are well drained. Their surface layer contains at least 15 to 20 percent angular flat fragments of sandstone or shale. These fragments do not interfere with cultivation but are abrasive to farm implements. The Calvin and Ungers soils are reddish in color, and the Gilpin soils are dominantly brown. The Gilpin and Ungers soils have a somewhat more strongly developed and slightly more sticky subsoil than the Calvin soils. The Calvin soils contain many more rock fragments in their subsoil than do the Gilpin and Ungers soils.

A severe hazard of further erosion because of slope is the major concern in managing these soils for farming. In most areas a moderate amount of surface soil has been lost through erosion. In spots the subsoil is exposed or nearly so, and there are some shallow gullies. Capability unit IIIe–10; woodland group 3f1.

**Calvin-Gilpin-Ungers channery loams, 20 to 35 percent slopes, moderately eroded** (CaD2).—In areas of this complex that have been cleared for use, the soils have lost enough of the original surface layer that plowing to normal depth turns up part of the subsoil in many places. Calvin soils make up about 70 percent of the acreage, Gilpin soils about 20 percent, and Ungers soils about 10 percent.

Included in mapping are areas where the plow layer is brighter colored than normal, and freshly plowed or cultivated fields have a distinctly streaked or spotty appearance. Also included are areas still in woodland where erosion has had much less effect.

These soils are very severely limited by the hazard of further erosion and are poorly suited to tilled crops. They can be used for hay, pasture, or sodded orchards,

as well as for woodland and wildlife habitat. Capability unit IVe–10; woodland group 2f1 (north aspects) or 3f1 (south aspects).

**Calvin-Gilpin-Ungers channery loams, 20 to 35 percent slopes, severely eroded** (CaD3).—The soils of this complex have long been exposed to erosion. Nearly all of the original surface layer has been lost through erosion, and the plow layer consists almost entirely of subsoil material. Calvin soils make up about 70 percent of the acreage, Gilpin soils about 20 percent, and Ungers soils about 10 percent. The surface layer of the Gilpin soil is yellowish brown, and that of the other soils is mostly red. Many flat fragments, mostly of sandstone, are on the surface.

Included in mapping are some gullied areas, many of which have been partly filled with rock fragments.

Even under the best management, tilling these soils is highly risky because of the severe hazard of further erosion. Pasture, woodland, and wildlife habitat are much more suitable uses for these soils. Capability unit VIe–3; woodland group 2f1 (north aspects) or 3f1 (south aspects).

**Calvin and Lehew channery loams, 35 to 50 percent slopes** (ClE).—These soils are mostly in forests of mixed hardwoods, mostly oak, but there are some red maple, black cherry, and other northern trees. In the few cleared areas, erosion has been active and there has been severe washing and some gullying.

Included in mapping are small areas where the soil is less reddish than Calvin and Lehew soils. Also included are areas where the slope is as much as 75 percent.

These soils are suited to woodland cover, which furnishes limited timber, watershed protection, and wildlife habitat. Capability unit VIIe–3; woodland group 3f1 (north aspects) or 4f1 (south aspects).

**Calvin, Ungers and Lehew channery loams, 10 to 20 percent slopes, moderately eroded** (CnC2).—These soils are on uplands. They are not complexly intermingled, and a single delineation on the soil map commonly has only one or two kinds of soil. Calvin soils occupy about 65 percent of the total acreage, Ungers soils about 25 percent, and Lehew soils about 10 percent.

These soils are red, well drained, and moderately deep to deep over bedrock. They have a plow layer that commonly contains 15 to 20 percent, angular, flat fragments of sandstone or shale. The rock fragments do not interfere with cultivation but are abrasive to farm implements. The Ungers soils have a subsoil that is more strongly developed and somewhat more sticky than the subsoil of Calvin and Lehew soils. The Lehew soils are more sandy, particularly in the subsoil, than the Calvin and Ungers soils.

Included in mapping are some areas that are similar to the Calvin soils but are less acid and are somewhat better supplied with plant nutrients. Also included are some areas where the surface layer is siltier than that of the profile described as representative for the Calvin series.

In at least two-thirds of the acreage, there have been significant losses of surface soil material, and the hazard of further erosion is severe. Under intensive conservation management, these soils are well suited to most crops. They are also well suited to pasture, woodland, and wildlife habitat. Capability unit IIIe–10; woodland group 3f1.

**Calvin, Ungers and Lehew channery loams, 20 to 35 percent slopes, moderately eroded** (CnD2).—In most cleared areas these soils have lost enough of their original surface layer that plowing turns up subsoil material in many places. Freshly plowed or cultivated fields have a spotty appearance because the more brightly colored subsoil material is exposed.

Included in mapping are areas of woodland where erosion has had little effect. Also included are a few wet spots or seepage spots.

These soils generally are poorly suited to cultivated crops and require very intensive and carefully applied conservation measures if they are to be kept in suitable condition for even part-time tillage. Safer farming uses are hay crops, pasture, or sodded orchards. These soils are also suited to woodland and wildlife habitat. Capability unit IVe–10; woodland group 2f1 (north aspects) or 3f1 (south aspects).

**Calvin, Ungers and Lehew channery loams, 20 to 35 percent slopes, severely eroded** (CnD3).—These soils have long been exposed to erosion. Most of the original surface layer has been washed away, the plow layer is now almost entirely subsoil material, and the soils are shallower than normal over bedrock. The surface layer is redder in color than in less severely eroded areas. Many flat rock fragments are on the surface or have been washed into gullies.

Tillage is so risky, because of the hazard of further erosion, that these soils should be used chiefly for pasture, reestablished woodland, wildlife habitat, and watershed protection. Capability unit VIe–3; woodland group 2f1 (north aspects) or 3f1 (south aspects).

## Cavode Series

The Cavode series consists of somewhat poorly drained soils on uplands. These soils formed in material weathered from soft, fine-grained shale. The native vegetation is mainly mixed hardwoods that are tolerant of seasonal wetness.

In a representative profile the surface layer is about 4 inches of dark-brown silt loam in the upper part, and about 6 inches of yellowish-brown, sticky silt loam in the lower part. The subsoil, about 20 inches thick, is yellowish-brown to yellowish-red, sticky to very sticky silty clay loam that is mottled with gray and other colors. The underlying material is light silty clay loam of various colors that is somewhat shaly and extends to a depth of about 5 feet. The soils are slowly permeable throughout the profile.

Cavode soils generally are difficult to work if even slightly too wet or too dry. They are late to warm up in spring, and planting frequently is delayed. Artificial drainage is needed for intensive use, including tilled crops. Drainage can be difficult, expensive, and not very efficient in very wet seasons. Cavode soils are severely limited for farming and for many other purposes. On all but the most nearly level areas the hazard of erosion is severe if the soils are used for tilled crops or are disturbed for other uses.

Representative profile of Cavode silt loam, in an uneroded inclusion in Cavode silt loam, 8 to 15 percent

slopes, moderately eroded, in a wooded area on the south side of Route 135, about 3½ miles west of Bloomington:

A1—0 to 4 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable, slightly sticky and slightly plastic; many roots; very strongly acid; abrupt, smooth boundary.

A2—4 to 10 inches, yellowish-brown (10YR 5/6) silt loam; weak, fine, subangular blocky structure; friable, sticky and slightly plastic; many roots; very strongly acid; gradual, smooth boundary.

B1—10 to 14 inches, yellowish-brown (10YR 5/6) silty clay loam, variegated with yellowish red (5YR 5/6); few, fine, distinct mottles of gray (10YR 5/1); weak, fine to medium, subangular blocky structure; friable to firm, sticky and plastic; many roots; very faint clay films; very strongly acid; clear, wavy boundary.

B21t—14 to 21 inches, yellowish-brown (10YR 5/6) heavy silty clay loam; common, medium, distinct mottles of yellowish red (5YR 5/6) and gray or light gray (10YR 6/1); moderate, medium, blocky structure; firm, very sticky and very plastic; very common roots; prominent gray or light-gray (10YR 6/1) films on aggregates; very strongly acid; clear, wavy boundary.

B22t—21 to 30 inches, yellowish-red (5YR 5/6) heavy silty clay loam, variegated with yellowish brown (10YR 5/6); common, coarse, distinct mottles of gray or light gray (10YR 6/1); strong, medium, blocky structure; very firm, very sticky and very plastic; few roots; prominent gray or light-gray (10YR 6/1) films on aggregates; very strongly acid; clear, smooth boundary.

C—30 to 60 inches, variegated yellowish-red (5YR 5/6), reddish-brown (5YR 4/3), and gray (10YR 5/1) light silty clay loam; inherent shaly cleavage; very firm, sticky and plastic; many very soft shale fragments; very strongly acid.

The solum ranges from about 30 to 50 inches or more in thickness. The thicker part of the range is limited to the nearly level or gently sloping soils of the series. The depth to bedrock of soft shale ranges from 3½ to 6 feet. Soft shale fragments are in the lower part of the B horizon, but are common to abundant only in the C horizon. Unlimed soils are strongly acid to very strongly acid, and acidity commonly increases with increasing depth.

In the A horizon, color value is 2 to 5 and chroma is 1 to 6. Value of 2 or 3 and chroma of 1 are limited to the thin A1 horizon of some undisturbed soils in wooded areas.

In the B horizon, hue is dominantly 10YR or yellower, but hue is redder in parts of the horizon that are of variegated colors. There are mottles with chromas of 2 or less throughout the B horizon, and there is commonly also some high-chroma mottling, in hues as red as 5YR. The B horizon is heavy silty clay loam or silty clay. It averages more than 35 percent clay content.

In the C horizon, the color range is about the same as in the B horizon. This horizon has a texture similar to that of the B horizon, but commonly has a somewhat higher silt content and lower clay content. Some of the shale fragments in the C horizon are fairly hard, but most of them are soft enough to crumble under moderate pressure.

Cavode soils do not closely resemble any other soils mapped in Garrett County. They formed in the same or similar kind of material as the moderately well drained Wharton soils and the poorly drained Armagh soils.

**Cavode silt loam, 0 to 8 percent slopes** (CoB).—This soil generally is deeper or thicker than the soil that has the profile described as representative of the Cavode series. Because water moves slowly into and through the soil, runoff is relatively rapid and causes a hazard of erosion. Improvement of drainage is the most important concern of management.

Included in mapping are areas that have lost a part of the original surface layer, and there are some spots where this layer is almost entirely gone.

If drainage is improved, the soil is suited to corn, hay crops, and pasture, as well as to woodland and wildlife habitat. Capability unit IIIw–5; woodland group 2w1.

**Cavode silt loam, 8 to 15 percent slopes, moderately eroded** (CoC2).—This soil has the profile described as representative of the series. It is thinner and shallower over bedrock than the more gently sloping Cavode soils. For use and management in farming this soil, control of further erosion is at least as important as, if not more important than, improvement of drainage. In most areas much of the surface layer has been lost through erosion, and plowing to normal depth generally turns up some subsoil. Areas still in woodland cover have been little affected by erosion.

Included in mapping are spots where the subsoil is exposed by erosion and there are a few shallow gullies. Also included are a few acres where the slope is more than 15 percent.

Properly managed, this soil is suited to corn, hay, and pasture, as well as to woodland and wildlife habitat. Capability unit IIIe–34; woodland group 2w1.

## Clymer Series

The Clymer series consists of deep, well-drained soils on uplands, generally on broad ridgetops. These soils formed in material weathered from acid sandstone. They commonly contain many angular, gravel-sized fragments of hard sandstone. The native vegetation is upland hardwoods, dominantly oak and maple, and such other species as black cherry and dogwood.

In a representative profile the surface layer is very dark grayish-brown channery loam in the upper 2 inches and brown channery loam in the lower 7 inches. The subsoil, about 26 inches thick, is yellowish-brown to dark yellowish-brown, friable sandy clay loam or light clay loam. The underlying material is yellowish-brown channery sandy loam. Hard bedrock is at a depth of about 44 inches.

The Clymer soils are very easy to work, but the hard sandstone fragments are abrasive to farm implements. Moisture moves readily through these soils, and available moisture capacity is moderate. Except for slope and the hazard of erosion, there are no particular limitations to use and management.

Representative profile of Clymer channery loam, 0 to 10 percent slopes, in a wooded area on Sang Run Road, about a mile west of McHenry:

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) channery loam; weak, fine, granular structure; very friable; many roots; about 15 percent angular sandstone fragments; strongly acid; abrupt, smooth boundary.

A2—2 to 9 inches, brown (10YR 5/3) channery loam; weak, medium, granular and very fine, subangular blocky structure; friable, slightly sticky; many roots; about 15 percent angular sandstone fragments; strongly acid; clear, smooth boundary.

B21t—9 to 20 inches, dark yellowish-brown (10YR 4/4) light clay loam; weak to moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; common roots; patchy clay films; about 5 percent angular sandstone fragments; very strongly acid; gradual, smooth boundary.

B22t—20 to 35 inches, yellowish-brown (10YR 5/6) sandy clay loam; weak, medium, subangular blocky structure; friable, slightly sticky; common roots; distinct clay films; about 10 percent angular sandstone fragments; very strongly acid; gradual, wavy boundary.

C—35 to 44 inches, yellowish-brown (10YR 5/6) channery sandy loam; massive; firm and compact; few roots; about 40 percent weathered sandstone fragments; extremely acid; abrupt, wavy boundary.
R—44 inches +, hard, gray to pale-brown sandstone.

The solum ranges from about 24 to 40 inches in thickness. The depth to hard sandstone bedrock ranges from about 3½ to 6 feet, but it is most commonly within the shallower part of this range. Angular flat fragments of hard sandstone are in all horizons. The A horizon commonly contains more of these than the B horizon, but the C horizon generally contains more fragments than either the A or B horizon. Unlimed soils are strongly acid to extremely acid, and acidity commonly increases with increasing depth.

Throughout the profile, hue is 10YR but ranges to 7.5YR in parts of the B and C horizon in some profiles. In the A horizon, value is 3 to 6 and chroma is 1 to 4. Value of 3 and chroma of 1 are limited to the thin A1 horizon of undisturbed soils in wooded areas.

In the B horizon, value is 3 to 5 and chroma is 4 to 8. The B horizon is clay loam, sandy clay loam, or heavy clay loam. The B horizon ranges from 18 to 30 percent in clay content.

The C horizon has about the same color range as the B horizon, but is variegated with redder colors in some profiles.

Clymer soils resemble Allegheny, Dekalb, and Gilpin soils. They contain more sand and less silt in the B horizon than Allegheny and Gilpin soils and are not so deep to bedrock as Allegheny soils. They contain less sand and more clay in the B horizon than Dekalb soils, and contain less coarse fragments. They formed in the same general kind of material as the well drained Leetonia soils that have an organic-stained layer in the subsoil, the moderately well drained Cookport soils, the poorly drained Nolo soils, and the very poorly drained Lickdale soils.

**Clymer channery loam, 0 to 10 percent slopes** (CrB).—Some areas of this soil are more sandy in the surface layer than in the profile described as representative of the series and in some places there are few, if any, rock fragments in the plow layer.

Except for slope, which causes a moderate hazard of erosion, the soil has no particular limitations for use for farming. It is used for tilled crops, as well as for pasture, woodland, and wildlife habitat. Capability unit IIe–4; woodland group 2o1.

## Cookport Series

The Cookport series consists of moderately deep, moderately well drained soils that have a very firm, dense, brittle layer in the lower part of the subsoil. These soils are on uplands. They formed in material weathered from hard acid sandstone that has some seams of shale or siltstone. They normally contain angular fragments of hard sandstone throughout the profile. The native vegetation is mixed hardwoods, mostly oak, maple, and hickory.

In a representative profile the surface layer is dark grayish-brown channery loam about 8 inches thick. The subsoil, about 30 inches thick, is yellowish-brown light clay loam that is mottled with gray. The lower 14 inches is variegated light clay loam that is hard, firm, brittle, dense, and platy. Bedrock begins at a depth of about 38 inches.

Cookport soils are easy to work except where they are too stony, but they are seasonally wet and somewhat late to warm up in spring. Moisture moves slowly through the profile, and the soil tends to dry out during prolonged dry weather. The Cookport soils are limited for many uses by impeded drainage and a seasonally perched water table, by slow movement of moisture through the subsoil, by seasonal droughtiness, by slope and the hazard of erosion, and locally by stoniness.

Representative profile of Cookport channery loam, 0 to 8 percent slopes, in a cultivated area on Route 495, east of Bittinger:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) channery loam; weak, fine, granular structure; friable, slightly sticky; many roots; slightly acid (limed); abrupt, smooth boundary.
B21t—8 to 17 inches, yellowish-brown (10YR 5/6) light clay loam; moderate, fine and medium, subangular blocky structure; friable to firm, sticky and slightly plastic; many roots; distinct clay films; about 10 percent angular sandstone fragments; medium acid; clear, smooth boundary.
B22t—17 to 24 inches, yellowish-brown (10YR 5/6) light clay loam; common, medium, distinct mottles of gray or light gray (10YR 6/1); moderate, coarse, blocky structure; friable to firm, sticky and plastic; few roots; distinct dark yellowish-brown (10YR 4/4) clay films; about 20 percent angular sandstone fragments; very strongly acid; clear, smooth boundary.
Bx—24 to 38 inches, light yellowish-brown (10YR 6/4) light clay loam; variegated with light brownish gray (10YR 6/2); common, coarse, distinct mottles of gray or light gray (10YR 6/1); strong, thick, platy structure; very firm and brittle, sticky and slightly plastic; widely separated, prominent flows of gray (10YR 5/1) silt or clay; about 30 percent angular sandstone fragments; very strongly acid; abrupt, wavy boundary.
R—38 inches +, hard, yellowish-brown sandstone.

The solum ranges from 30 to 40 inches in thickness. Bedrock is at a depth of 30 to 40 inches. In some profiles there is a very thin, friable C horizon directly above the bedrock. Channers of hard sandstone make up 10 to 30 percent of the soil in all horizons, and are commonly more abundant with increasing depth. Large areas of Cookport soils are very stony. Unlimed soils are strongly acid to extremely acid, and acidity commonly increases with increasing depth.

Throughout the profile, matrix color is commonly 10YR, but is 7.5YR in the B horizon in places. In the A horizon, value is 3 to 5 and chroma is 2 to 6. Value of 3 is limited to the thin A1 horizon of undisturbed soils in wooded areas.

In the B horizon, matrix value is 4 or 5 and chroma is 4 to 8. Mottling with chroma of 2 or less is in all but the upper few inches of the B horizon. High-chroma mottling is also in the B horizon of many soils. The B horizon ranges from loam to light clay loam or sandy clay loam. The upper 20 inches of the B horizon averages about 20 to 30 percent clay content.

Cookport soils resemble Ernest soils, but are less silty and shallower to bedrock. They formed in the same general kind of material as the well-drained Clymer, Dekalb, and Leetonia soils, the poorly drained Nolo soils, and the very poorly drained Lickdale soils.

**Cookport channery loam, 0 to 8 percent slopes** (CtB).—This soil has the profile described as representative of the series. Locally, there has been some surface scouring and some loss of surface soil through erosion, but generally the soil has been well protected and remains in good condition for use. The soil has impeded drainage and poor aeration in the lower part of the subsoil, but the moderate hazard of erosion generally is a more serious concern of management.

Included with this soil in mapping are a few severely eroded spots and some areas that have fewer rock fragments in the plow layer than normal. Also included are some spots that are siltier in the surface layer than is typical for this soil.

Both the hazard of erosion and internal drainage conditions are limitations to the use of this soil for farming and for some other purposes. The soil is used mostly for

corn, hay crops other than alfalfa, and pasture. Capability unit IIe–13; woodland group 2w1.

**Cookport channery loam, 8 to 15 percent slopes, moderately eroded** (CtC2).—On this soil there is a severe hazard of further erosion, and except in a few wooded areas, much of the original surface layer has been washed away. This soil is thinner and shallower than more gently sloping areas of the same soils. Bedrock is at a depth of less than 30 inches in places. Erosion has resulted in accumulations of hard gravel in some places on the surface.

Included with this soil in mapping are a few acres that slope more than 15 percent.

Drainage is not needed for some crops, but intensive soil and water conserving measures are needed for continued cultivation. Capability unit IIIe–13; woodland group 2w1.

**Cookport and Ernest very stony silt loams, 0 to 8 percent slopes** (CuB).—This unit consists of very stony areas of either of these two kinds of soils. These soils are similar in most characteristics, as well as in suitability for various uses. Any delineation on the maps can be either the Cookport series or the Ernest series, but only in a few places does a delineation include both. The Cookport soils, which generally are only 30 to 40 inches over bedrock, are on uplands; the Ernest soils, which are deeper over bedrock, are in draws or on benches and foot slopes. These soils have many stones more than 10 inches in diameter, mostly on or near the surface. The stones are as much as 30 feet apart, but are commonly much closer together.

Included with these soils in mapping are small areas where the subsoil is either more sandy and gravelly or more clayey and sticky than is typical for either the Cookport or the Ernest series.

The stoniness precludes tillage by modern methods, but the soils are suited to hay, pasture, woodland, and wildlife habitat. Most areas are in woodland. Capability unit VIs–3; woodland group 2w1.

**Cookport and Ernest very stony silt loams, 8 to 25 percent slopes** (CuD).—These soils are mostly of the Cookport series. The Ernest soils are mostly on short, steep foot slopes.

Included with these soils in mapping are spots where the subsoil is either more clayey and sticky or more sandy and gravelly than is typical for these soils. Also included are some small areas where the upper part of the subsoil is reddish in color.

Slope does not significantly affect farming, but it does have a limiting effect on some nonfarm uses, particularly those related to community development. Capability unit VIs–3; woodland group 2w1.

## Cut and Fill Land

Cut and fill land (Cv) consists in part of areas where the soil has been cut away and graded. The remaining areas have been filled with soil and other material, commonly to a depth of several feet. The fill is mostly soil material obtained from leveling operations in areas of well-drained upland soils. Some areas have been cut or filled and then ballasted with cinders, shaly or stony mine wastes, or gravel.

Little of this land type is used for farming. Most of it is used for commercial or residential purposes. It is so variable in composition that the suitability of any particular area for a given use must be determined by onsite investigation. Not placed in a capability unit or woodland group.

## Dekalb Series

The Dekalb series consists of moderately deep, well-drained soils on mountains. These soils formed in materials weathered from gray to pale-brown, acid sandstone that has some thin strata of shale or siltstone. They characteristically contain abundant fragments of angular, hard sandstone. The native vegetation is mixed hardwoods, dominantly black oak.

In a representative profile the surface layer is sandy loam about 8 inches thick. It is black, or nearly so, in the thinner upper part and brown in the lower part. The subsoil, about 18 inches thick, is yellowish-brown, friable sandy loam. The underlying material is yellowish-brown coarse sand. Hard bedrock begins at a depth of about 36 inches. All parts of the profile are very stony.

Dekalb soils are easy to work except where they are too stony, but the sandstone fragments are abrasive to farming equipment and implements. Use of these soils is limited by low available moisture capacity, low content of plant nutrients, very strong to extreme acidity, slope, the hazard of erosion, and in the greater part of the acreage by stoniness. These soils are moderately rapidly permeable to rapidly permeable.

Representative profile of a Dekalb very stony sandy loam, in a wooded area of Dekalb and Leetonia very stony sandy loams, 15 to 25 percent slopes, on Maynerdier Ridge Road, about one-fourth mile west of Bear Hill Road:

A1—0 to 3 inches, black (10YR 2/1) very stony sandy loam; weak, fine, granular structure; loose to very friable; many roots; many angular sandstone fragments, 10 inches in size or larger; very strongly acid; clear, wavy boundary.

A2—3 to 8 inches, brown (10YR 4/3) very stony sandy loam; weak, fine, granular structure; friable; many roots; many angular sandstone fragments, 10 inches in size or larger; very strongly acid; clear, wavy boundary.

B2—8 to 20 inches, yellowish-brown (10YR 5/4 to 5/6) sandy loam; weak to very weak, coarse, subangular blocky structure; friable, slightly sticky; many roots; contains about 60 percent angular sandstone fragments, many 10 inches in size or larger; very strongly acid; clear, wavy boundary.

B3—20 to 26 inches, yellowish-brown (10YR 5/6) sandy loam; very weak, medium, subangular blocky structure; very friable; common roots; numerous angular sandstone fragments, 10 inches in size or larger; very strongly acid; abrupt, broken boundary.

C—26 to 36 inches, yellowish-brown (10YR 5/8) channery coarse sand; single grain; loose; very few roots; abundant angular sandstone fragments, 10 inches in size or larger; very strongly acid; abrupt, irregular boundary.

R—36 inches +, hard, gray to yellowish-brown sandstone, coarsely fractured.

The solum ranges from about 20 to 26 inches in thickness. The depth to bedrock ranges from about 20 to 40 inches. These soils contain angular sandstone fragments of all sizes. These fragments make up about 15 or 20 percent of the A horizon, 40 to 60 percent of the B horizon, and an even greater percentage of the C horizon. Large areas are very stony. Unlimed soils are very strongly acid to extremely acid, and acidity commonly increases with increasing depth.

In the A horizon color value is 2 to 6 and chroma is 1 to 4. A value of 2 or 3 is limited to the thin A1 horizon of

undisturbed soils in wooded areas. The fine material in the A horizon is loam or sandy loam.

In the B horizon hue is 10YR or 7.5YR, value is 5 or 6, and chroma is 4 to 8. The fine material in the B horizon is loam or sandy loam.

The C horizon has about the same color range as the B horizon. The material in the C horizon ranges from sandy loam to sand or coarse sand.

Dekalb soils resemble Clymer and Gilpin soils in color and drainage. They have a coarser textured, less clayey B horizon than either Clymer or Gilpin soils and contain more coarse fragments, particularly those smaller than stones. They lack the reddish colors of the otherwise similar Lehew soils. Dekalb soils formed in the same general kind of material as the well drained Clymer and Leetonia soils, the moderately well drained Cookport soils, the poorly drained Nolo soils, and the very poorly drained Lickdale soils.

**Dekalb channery loam, 0 to 10 percent slopes** (DbB).—This soil has a profile similar to that described as representative of the series, except that both the surface layer and the subsoil are loam and contain more silt and clay and less sand. The coarse fragments of sandstone are dominantly no more than 6 inches long and no more than 2 or 3 inches thick. This soil commonly is on ridgetops where most of the surrounding soils are steeper, very stony, or both.

Included in mapping are some small areas where there are few, if any, hard sandstone fragments in the plow layer. Also included are a few areas where the entire profile contains more sand than is typical for this soil.

This soil is used for tilled crops, hay and pasture, and orchard trees. Erosion is a moderate hazard, but fairly simple conservation practices that are easy to establish and maintain can keep this soil in safe condition for continued cropping. Capability unit IIe–10; woodland group 3f1.

**Dekalb channery loam, 10 to 20 percent slopes, moderately eroded** (DbC2).—Most areas of this soil have been cleared and used for many years, and much of the surface layer has been lost through erosion. Plowing commonly turns up the brighter, yellowish-brown subsoil material and hard, angular sandstone fragments.

Included in mapping are a few wooded spots that are only slightly eroded and a few small areas where shallow gullies have cut into the subsoil. Also included are some spots where there are only a few hard fragments in the plow layer.

If appropriate conservation measures are applied, this soil can be used for regular cultivation and other fairly intensive uses. Capability unit IIIe–10; woodland group 3f1.

**Dekalb channery loam, 20 to 35 percent slopes, moderately eroded** (DbD2).—This is the steepest nonstony soil of the Dekalb series in Garrett County. In cleared areas of this soil, much of the original surface layer has been lost. Some of these areas are cut by gullies.

Included in mapping are wooded areas where little erosion has taken place. Also included are a few acres that are sandier than typical, some areas that have only a few coarse fragments in the surface layer, and some areas where subsoil drainage is somewhat restricted.

If this soil is cultivated, the hazard of further erosion is severe unless intensive protective measures are applied. This soil is suited to pasture and woodland. Capability unit IVe–10; woodland group 2f1 (north aspects) or 3f1 (south aspects).

**Dekalb-Calvin-Lehew very stony loams, 0 to 15 percent slopes** (DcC).—This complex is on uplands. Dekalb soils make up about 40 percent of the acreage, Calvin soils about 40 percent, and Lehew soils about 20 percent. The Dekalb soils have a yellowish-brown subsoil; the Calvin and Lehew soils have a distinctly reddish subsoil. The Lehew soils are more sandy and less silty, particularly in the subsoil, than the Calvin soils; otherwise, these soils are similar. They are well drained and generally 20 to 40 inches deep over bedrock. They can be used and managed in much the same way.

Included are a few areas where the soils are somewhat less acid and a little more fertile than is typical.

These soils have sandstone fragments, ranging from 10 inches in size to boulder size, that are only a few feet apart on the surface and commonly much closer together in the subsoil. In places there are large, massive shale fragments, particularly in the Calvin soils. Tillage is not practical by any modern means. These soils are well suited to wood crops, and some areas produce fairly good hay or pasture, particularly if stones are removed. Capability unit VIs–4; woodland group 3f1.

**Dekalb-Calvin-Lehew very stony loams, 15 to 25 percent slopes** (DcD).—Dekalb soils make up about 40 percent of this complex, Calvin soils about 30 percent, and Lehew soils about 30 percent.

Most of this complex is wooded and produces commercial wood crops. These soils are suited to woodland, and they furnish good watershed protection, as well as wildlife habitat. Capability unit VIs–4; woodland group 2f1 (north aspects) or 3f1 (south aspects).

**Dekalb and Gilpin very stony loams, 0 to 15 percent slopes** (DgC).—This mapping unit consists of very stony loams of the Dekalb and Gilpin series, but generally not both soils in a given area. Dekalb soils occur where the underlying rock is mostly very hard sandstone. Gilpin soils occur where the sandstone is either finer grained, or has more impurities of shale, siltstone, or both. Gilpin soils contain more silt than Dekalb soils and have more clay in the subsoil than Dekalb soils. Stones 10 inches or larger in size and commonly less than 30 feet apart are on the surface of these soils.

Included are some areas, particularly of Gilpin soils, that are siltier than typical, especially in the surface layer.

These soils are so stony that tillage is impractical by ordinary means, although some areas have been cleared and are used for hay or pasture or for nonfarm uses. Limitations are slight for woodland management, but moderate for most nonfarm uses. Capability unit VIs–4; woodland group 3f1.

**Dekalb and Gilpin very stony loams, 15 to 25 percent slopes** (DgD).—This is the most extensive mapping unit in Garrett County. It almost completely dominates the landscape in some areas (fig. 5). The surface is somewhat more irregular and more bouldery than that of more gently sloping soils of the same series. These soils are mostly wooded, but they are suitable for limited use for hay and pasture if stones are removed. Capability unit VIs–4; woodland group 2f1 (north aspects) or 3f1 (south aspects).

**Dekalb and Leetonia very stony sandy loams, 0 to 15 percent slopes** (DlC).—This mapping unit consists of very

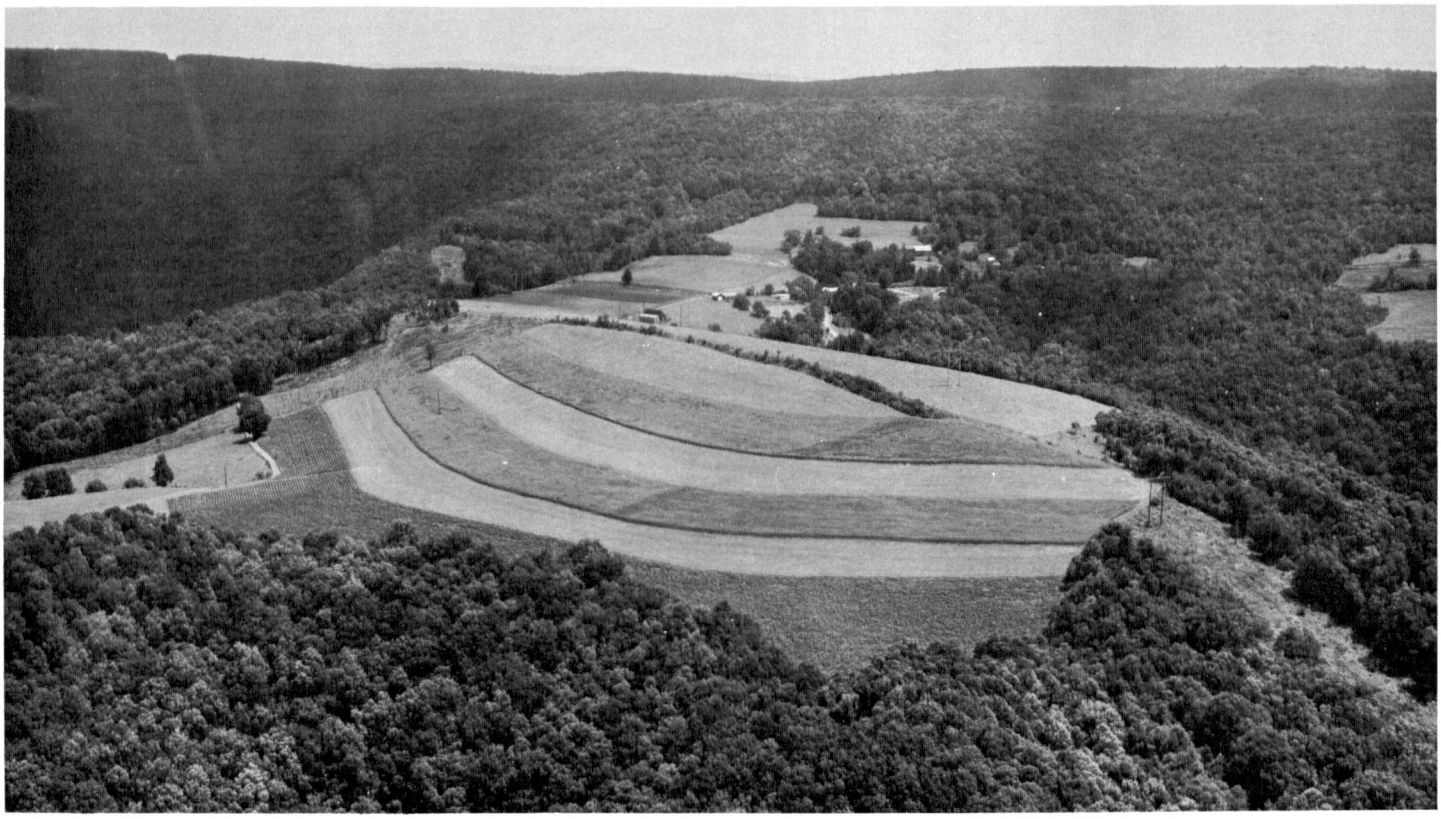

*Figure 5.*—**A typical landscape in the northeastern part of the county. Wooded areas are mostly on Dekalb and Gilpin very stony loams, and to some extent on Stony land, steep. On the cleared ridgetops are more gently sloping Dekalb and Gilpin soils that are not too stony for cultivation.**

stony sandy loam of either the Dekalb series or the Leetonia series. A few areas consist of both kinds of soils. The more extensive Dekalb soils generally are at lower elevations than the Leetonia soils, which are at the higher, more exposed elevations. The soils are similar, except that the Leetonia soils have reddish, organic layers in the subsoil and contain coarser sands than the Dekalb soils. Both soils are on uplands, both are well drained, and both are 20 to 40 inches deep over bedrock.

These soils are not suited to cultivation. They are suited to woodland, but timber yields are lower than on other well-drained soils of the uplands. Tree growth is especially slow on the Leetonia soils, which are at the highest elevations where the growing season is the shortest of any area in the county. Limitations are moderate to severe for community development and related nonfarm uses. Capability unit VIs–4; woodland group 4f1.

**Dekalb and Leetonia very stony sandy loams, 15 to 25 percent slopes** (DlD).—These soils have the profiles described as representative for their respective series. The slope severely limits some nonfarm uses, but has little effect on farming because the soils are too stony for tillage and produce only limited hay or pasture. The Leetonia soil generally is at higher elevations than the Dekalb soil. Capability unit VIs–4; woodland group 4f1.

## Elkins Series

The Elkins series consists of very poorly drained soils on flood plains. These soils formed in recent sediment that washed from areas of acid rock and soil. Elkins soils are in level to depressed areas on low first bottoms of streams. The native vegetation is wetland hardwoods, grasses, and sedges.

In a representative profile the surface layer is very dark gray to black silt loam about 11 inches thick. The subsoil, about 25 inches thick, is gray silty clay loam, mottled with yellowish red and strong brown. The underlying material is gray or light-gray, mottled sandy clay loam. Bedrock begins at a depth of about 76 inches. This bedrock is not related to the soil material above it.

Elkins soils are fairly sticky, and are difficult to work when a little too wet. They are slowly permeable. They need artificial drainage and flood protection. Areas subject to severe or frequent flooding are of little use for farming, and use for most nonfarm purposes is severely limited.

Representative profile of Elkins silt loam, in a cultivated area on Sand Flat Road about 2 miles south of its intersection with U.S. Highway 219:

Ap—0 to 11 inches, black (5Y 2/1) silt loam; weak, medium, granular structure; friable, slightly sticky; many roots; slightly acid (limed); abrupt, smooth boundary.

B21g—11 to 27 inches, gray (N 5/0) silty clay loam; common, fine and medium, distinct mottles of yellowish red (5YR 5/6); weak, fine to medium, blocky and subangular blocky structure; friable to firm, sticky and plastic; common roots in upper part; dark-brown (7.5YR 3/2) silty material in old root channels; strongly acid; diffuse boundary.

B22g—27 to 36 inches, gray (N 5/0) silty clay loam; common, medium, prominent mottles of strong brown (7.5YR 5/6), and yellowish red (5YR 5/6); weak, fine, subangular blocky structure; firm, sticky and plastic; dark-brown (7.5YR 3/2) silty material in old root channels; very strongly acid; clear, smooth boundary.

IICg—36 to 76 inches, gray or light-gray (10YR 6/1) sandy clay loam; variously mottled and streaked with yellowish red (5YR 5/6); massive; friable, slightly sticky and slightly plastic; very strongly acid; abrupt, smooth boundary.

IIIR—76 inches +, hard, gray sandstone.

The solum ranges from about 30 to 50 inches in thickness. Unconforming bedrock is at depths of more than 6 feet. Water-worn pebbles are in the C horizon in some places. Unlimed soils are strongly acid to extremely acid, and acidity commonly increases with increasing depth.

In undisturbed profiles there is an A1 horizon 6 to 12 inches thick and a much thinner A2 horizon. In the A horizon hue ranges from 10YR to 5Y, value is 2 to 4, and chroma is 1 or 2. Value of 4 is limited to undisturbed A2 horizons.

In the B horizon, matrix color is 10YR to 5Y in hue or is neutral. The value is 4 or 5, and the chroma is 0 to 2. Mottling is in hue 10YR or redder, with value of 3 to 5 and chroma of 4 to 8.

The C horizon has about the same range in color as the B horizon, except that in some profiles it lacks mottles. The C horizon is fine sandy loam or sandy clay loam.

Elkins soils resemble Lickdale soils in color and in natural drainage. They contain less sand and more silt in the B horizon than Lickdale soils, are deeper to bedrock, and are only on flood plains. Also on flood plains are the well drained Pope soils, the moderately well drained Philo soils, and the poorly drained Atkins soils.

**Elkins silt loam** (Ek).—All of this soil is level or very nearly level, and there is little or no surface runoff. If this soil is artificially drained and is well enough protected so that there is no more than a moderate hazard of flooding, it is very well suited to corn and to some hay crops, as well as to pasture. If flooding is very severe or very frequent, use is limited mostly to water-tolerant woodlands and to habitat for wetland wildlife. Capability unit IIIw–7; woodland group 1w2.

## Ernest Series

The Ernest series consists of deep, moderately well drained soils that have a firm, brittle fragipan in the lower part of the subsoil. These soils are on foot slopes and benches and in draws. They formed in local colluvial accumulations, mostly from areas of acid, shaly material. The native vegetation is hardwoods, dominantly oak, maple, and hickory, which tolerate wetness.

In a representative profile the surface layer is silt loam about 10 inches thick. It is dark grayish brown in the upper part and brown in the lower part. The upper part of the subsoil, about 20 inches thick, is brown to yellowish-brown silty clay loam that is sticky and mottled with gray in the lower part. The lower part of the subsoil, about 22 inches thick, is a gray, mottled fragipan that is firm, dense, brittle, and platy. The underlying material is a continuation of the fragipan in which there is little evidence of any soil development.

Ernest soils are fairly easy to work at a favorable moisture content, but they generally are wet in spring. Plowing and planting are delayed by wetness. These soils are limited in use by seasonal wetness and a perched water table, by moderately slow movement of water through the fragipan in the lower part of the subsoil, by a somewhat restricted rooting zone, by slope and the hazard of erosion, and in large areas, by stoniness.

Representative profile of Ernest silt loam, 3 to 8 percent slopes, in a cultivated area on U.S. Highway 50, about half a mile east of the West Virginia State line:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; very weak, medium, granular structure; friable, slightly sticky and slightly plastic; many roots; slightly acid (limed); clear, wavy boundary.

A2—7 to 10 inches, brown (10YR 4/3) silt loam; weak, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; many roots; medium acid; clear, wavy boundary.

B21t—10 to 16 inches, brown (10YR 4/3) light silty clay loam, variegated with yellowish brown (10YR 5/6); weak, fine, subangular blocky structure; friable, sticky and plastic; many roots; indistinct clay films; medium acid; gradual, wavy boundary.

B22t—16 to 30 inches, yellowish-brown (10YR 5/6) silty clay loam; common, medium, distinct mottles of gray (10YR 5/1); moderate, medium, subangular blocky structure; friable, sticky and plastic; many roots; distinct clay films; dark-gray (10YR 4/1) fine material in old root channels; strongly acid; clear, wavy boundary.

Bx—30 to 52 inches, gray or light-gray (10YR 6/1) light silt loam; common, medium, distinct mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6); moderate, thick, platy and medium, blocky structure; firm and brittle, sticky and slightly plastic; distinct to prominent, dark yellowish-brown (10YR 4/4) clay films and flows; very strongly acid; diffuse boundary.

Cx—52 to 60 inches, light-gray (2.5Y 7/2) shaly silt loam; common, coarse, prominent mottles of yellowish brown (10YR 5/6); moderate, thick, platy structure; firm and brittle, slightly sticky; faint films between plates; about 30 percent weathered shale fragments; very strongly acid.

The solum ranges from about 36 to 60 inches in thickness. Unconforming bedrock is at depths greater than 4 feet. Any horizon can contain as much as 20 percent shale fragments. Scattered flat fragments of sandstone are on or near the surface. Large areas of Ernest soils are very stony and have fragments of sandstone or other rock, 10 inches in size or larger, mostly near the surface. Unlimed soils are strongly acid or very strongly acid, and acidity commonly increases with increasing depth.

Throughout the profile, the matrix hue generally is 10YR, but ranges to 7.5YR in the upper part of the B horizon and 2.5Y in the lower part of the profile. In the A horizon, value is 3 to 5 and chroma is 1 to 4. Value of 3 and chroma of 1 are limited to the thin A1 horizon of undisturbed soils in wooded areas.

In the B horizon, matrix value is 4 to 6 and chroma is 1 to 6. Mottles have a chroma of 2 or less in the upper part of the B horizon, and a chroma of 3 or higher in the lower part of the B horizon. The B horizon is silt loam or silty clay loam.

The C horizon has about the same range of color as the lower part of the B horizon. It is silt loam to silty clay and commonly is shaly.

In Garrett County, the matrix color in the lower part of the B horizon and in the C horizon tends to be grayer and lower in chroma than in most survey areas.

Ernest soils resemble Albrights and Cookport soils. They are more silty and are deeper to bedrock than Cookport soils. They lack the reddish-brown subsoil colors that are characteristic of Albrights soils.

In Garrett County Ernest soils are mapped individually and as large areas with the very stony Cookport soils.

**Ernest silt loam, 0 to 3 percent slopes** (ErA).—On this soil the hazard of erosion is minimal, although a few places show the effects of runoff from adjacent higher lying soils.

Included with this soil in mapping are areas of soils that are somewhat more sandy and gravelly in the upper part of the subsoil than is typical.

This soil needs drainage improvement in places for full use for tillage; seasonal wetness is the most serious limitation to the production of cultivated crops. Such perennial herbaceous plants as alfalfa are damaged by frost heaving. Capability unit IIw–3; woodland group 2w1.

**Ernest silt loam, 3 to 8 percent slopes** (ErB).—This soil has the profile described as representative of the series.

Included with this soil in mapping are areas where there has been some moderate loss of surface soil through erosion, and there are some scattered shallow gullies. Also included are some small areas that are sandier or more gravelly in the upper part of the subsoil than is typical of the Ernest series.

This soil needs drainage improvement in places for some crops and uses, but the hazard of erosion generally is of more concern to farm management if the soil is to be kept in regular cultivation. Capability unit IIe–13; woodland group 2w1.

**Ernest silt loam, 8 to 15 percent slopes, moderately eroded** (ErC2).—Most areas of this soil are being or have been tilled, and there have been important losses of the surface layer through erosion.

Included with this soil in mapping are some spots that are somewhat gravelly, particularly in the subsoil, and a few acres under woodland cover that show no evidence of damage by erosion.

The hazard of further erosion is a severe limitation if this soil is tilled. If tillage is to be continued on a regular basis with safety, intensive conservation measures must be applied and maintained. Capability unit IIIe–13; suitability group 2w1.

**Ernest silt loam, 15 to 30 percent slopes, moderately eroded** (ErD2).—Included with this soil in mapping are a few shallow gullies, some gravelly areas, and a few acres where the slope is a little more than 25 percent.

This soil is poorly suited to tilled crops because of the very severe hazard of further erosion. It is better suited to long-term hay or improved pasture. For such uses drainage improvement may not be necessary. Capability unit IVe–9; woodland group 2w1.

## Gilpin Series

The Gilpin series consists of moderately deep, well-drained soils formed on uplands in material weathered from gray to brown, acid shale and siltstone that commonly includes some thin beds of sandstone. The native vegetation is mostly oak and maple and some Virginia pine and white pine.

In a representative profile the surface layer is brown to dark-brown silt loam about 8 inches thick that contains flat fragments of sandstone. The subsoil, about 16 inches thick, is yellowish-brown channery silt loam that is a little finer textured and stickier than the surface layer. The underlying material is channery loam. Bedrock begins at a depth of about 29 inches.

Gilpin soils are easy to work except where they are too stony. The small flat fragments of sandstone are abrasive to farm implements but do not affect the capability of the soil for farming. Gilpin soils have moderate available moisture capacity and are moderately permeable. Except for stoniness, their chief limitations to use are those imposed by slope, hazard of erosion, and by the moderate depth over bedrock.

Representative profile of Gilpin channery silt loam, 0 to 10 percent slopes, moderately eroded, in a cultivated area about 2 miles west of Emanuel Church:

Ap—0 to 8 inches, brown or dark-brown (10YR 4/3) channery silt loam; weak, fine, granular structure; friable; many roots; about 20 percent channers; medium acid (limed); abrupt, smooth boundary.

B21t—8 to 15 inches, yellowish-brown (10YR 5/4) channery heavy silt loam; weak, fine, subangular blocky structure; friable, slightly sticky; common roots; thin patchy clay films; about 25 percent channers; strongly acid; clear, wavy boundary.

B22t—15 to 24 inches, yellowish-brown (10YR 5/4) channery heavy silt loam; weak, fine and medium, subangular blocky structure; friable, slightly sticky and slightly plastic; common roots; discontinuous clay films; about 30 percent channers; very strongly acid; clear, wavy boundary.

C—24 to 29 inches, brownish-yellow (10YR 6/6) and yellowish-red (5YR 4/6) channery loam; inherent rock structure; firm; very few roots; about 30 percent coarse fragments; very strongly acid; abrupt, irregular boundary.

R—29 inches +, gray to yellowish-brown shale, fractured but mostly unbroken.

The solum ranges from about 20 to 36 inches in thickness. The depth to bedrock ranges from about 24 to 40 inches. Coarse fragments smaller than stones make up 15 to 30 percent of the soil. These fragments are shale, siltstone, or fine-grained sandstone, alone or in combination. Large areas of Gilpin soils are very stony, the stones consisting of angular or subangular sandstone or hard siltstone. Unlimed soils are strongly acid to extremely acid, and acidity commonly increases with increasing depth.

Throughout the profile, hue is 10YR, ranging to 7.5YR in the lower part of the solum and in the C horizon. In the A horizon, value is 3 to 5 and chroma is 2 to 4. Value of 3 is commonly limited to the thin A1 horizon of undisturbed soils in wooded areas. The A horizon is loam or silt loam.

In the B horizon, value commonly is 5, and chroma is 4 to 8. The B horizon is silt loam or light silty clay loam.

The C horizon is similar to the B horizon in color, but in many profiles the value or the chroma, or both, is higher than in the B horizon. The fine material in the C horizon is loam or silt loam.

Gilpin soils resemble Allegheny, Clymer, and Ungers soils. They have a thinner solum, are shallower to bedrock, and are somewhat more silty and less sandy, particularly in the subsoil than Allegheny and Clymer soils. They do not have the reddish colors, particularly in the subsoil, that are characteristic of the otherwise similar Ungers soils.

In addition to the following mapping units, large areas of Gilpin soils are mapped with Calvin, Dekalb, and Ungers soils.

**Gilpin channery silt loam, 0 to 10 percent slopes, moderately eroded** (GnB2).—This soil has the profile described as representative for the series. On much of this soil a few inches of the original granular surface layer has been lost through erosion, and in isolated spots the subsoil has been exposed.

Included in mapping are a few areas, mostly under woodland cover, that show little evidence of erosion. Also included are a few acres that are deeper over bedrock than is typical and that have few, if any, sandstone fragments in the plow layer.

This is one of the most intensively farmed soils in the county. Capability unit IIe–10; woodland group 2o1.

**Gilpin channery silt loam, 10 to 20 percent slopes, moderately eroded** (GnC2).—Much of the surface layer of

this soil is gone in most places, and in spots the sticky subsoil is turned up by plowing. Some of the areas are cut by shallow gullies and some of these are partly filled with the channers or hard rock fragments that were left behind by the erosion process.

Included with this soil in mapping are a number of acres that have fewer hard fragments of rock in the plow layer than is typical.

This soil is severely limited for farming because of the severe hazard of further erosion. If intensive conservation measures are applied, however, this soil can be used for regular cultivation. Capability unit IIIe–10; woodland group 2o1.

**Gilpin channery silt loam, 20 to 35 percent slopes, moderately eroded** (GnD2).—Included with this soil in mapping are a few acres that have practically no coarse fragments in the plow layer. This soil is poorly suited to regular tillage due to the hazard of further erosion. It is a good soil for such close-growing nontilled crops as hay or highly improved pastures, or for sodded orchards. Some wooded areas remain where erosion has not yet become a problem, and these are better left under woodland cover unless specifically needed for more intensive uses. Capability unit IVe–10; woodland group 2r1 (north aspects) or 3r1 (south aspects).

**Gilpin channery silt loam, 20 to 35 percent slopes, severely eroded** (GnD3).—This soil has been severely damaged by erosion. In most places the subsoil has been exposed or has been cut by gullies, some of which are deep. If tilled, the plow layer consists almost entirely of subsoil material. In many places the surface of the soil is almost covered by angular rock fragments left after fine soil material has washed away. These fragments help to prevent further erosion, particularly if the soil is not plowed.

This soil is suited to limited hay production or carefully controlled grazing. It is also suitable for orchards if the soil surface is maintained under sod or some other close ground cover. Capability unit VIe–3; woodland group 2r1 (north aspects) or 3r1 (south aspects).

## Laidig Series

The Laidig series consists of deep, well-drained soils that have a firm brittle layer in the lower part. These soils are on foot slopes where they formed in colluvial accumulations from acid sandstone material and, generally, some shale. All of the Laidig soils in Garrett County are very stony. The native vegetation is mixed hardwoods, dominantly oak.

In a representative profile the surface layer is loam about 11 inches thick. The thinner upper part is very dark grayish brown, and the thicker lower part is light yellowish brown. The subsoil, about 21 inches thick, is yellowish-brown sandy clay loam. Beneath this is a very firm, dense, and brittle fragipan. Bedrock begins at a depth of about 76 inches. The bedrock is not related to the soil profile above it.

Although there is some restriction of water movement through the fragipan and there are seepage spots on some slopes, Laidig soils are essentially well drained and aerated.

These Laidig soils are not workable by modern farming methods because of stoniness. They are further limited in use by slope and the hazard of erosion. They have moderate available moisture capacity, and are suited to such vegetation as pasture and woodland.

Representative profile of Laidig very stony loam, 8 to 25 percent slopes, in a wooded area on Chestnut Grove Road, west of Barnum Road:

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) very stony loam; moderate, medium, granular structure; very friable; many roots; sandstone fragments, 10 inches in size or larger; strongly acid; abrupt, wavy boundary.

A2—3 to 11 inches, light yellowish-brown (10YR 6/4) very stony loam; weak, medium, granular structure; friable; common roots; sandstone fragments, 10 inches in size or larger; very strongly acid; clear, wavy boundary.

B2t—11 to 32 inches, yellowish-brown (10YR 5/6) sandy clay loam, variegated with strong brown (7.5YR 5/6); moderate, fine and medium, subangular blocky structure; friable to firm, slightly sticky and slightly plastic; common roots in upper part; yellowish-brown (10YR 5/4) clay films; very strongly acid; gradual, wavy boundary.

Cx—32 to 76 inches, variegated yellowish-brown (10YR 5/4), red (2.5YR 5/6), and pinkish-gray (5YR 6/2) sandy clay loam or heavy sandy loam; strong, thick, platy structure and moderate, medium and coarse, blocky structure; very firm and brittle, slightly sticky; very few roots; scattered indistinct clay films; a few stones; extremely acid; abrupt, irregular boundary.

IIR—76 inches +, yellowish-brown hard sandstone that contains some thinly interbedded shale.

The solum ranges from about 30 to 40 inches in thickness. The combined thickness of the solum and the Cx horizon ranges from about 60 to 100 inches in thickness. Unconforming bedrock is commonly at depths of more than 6 feet. Sandstone gravel or shale fragments or both make up about 20 to 25 percent of the solum. Unlimed soils are strongly acid to extremely acid, and acidity commonly increases with increasing depth.

Throughout the profile, hue is 10YR, ranging to 7.5YR in parts of the B horizon. In some profiles there are variegations with redder hues, particularly in the C horizon.

In the A horizon, value is 3 to 6, and chroma is 1 to 4. Value of 3 and chroma of 1 are limited to the thin A1 horizon of undisturbed soils in wooded areas.

In the B horizon, value is 4 or 5 and chroma is 4 to 8. The B horizon is heavy loam, sandy clay loam, or clay loam.

The C horizon is commonly strongly variegated, and in most profiles has low-chroma mottling. In some profiles there is also some reticulate high-chroma mottling. The C horizon is highly variable, but is most commonly sandy loam or sandy clay loam.

Laidig soils do not closely resemble any other soils mapped in Garrett County. They lack the reddish-brown colors of the otherwise similar Meckesville soils. They formed in material similar to that in which the poorly drained Andover soils formed.

**Laidig very stony loam, 0 to 8 percent slopes** (LaB).—This soil has a profile similar to that described as representative of the series. The stones on and near the surface generally are less than 30 feet apart.

Included with this soil in mapping are a few spots near the Potomac River where the profile is sandier than described and generally lacks the fragipan in the lower part of the subsoil.

None of this soil is cultivated. Some is used for grazing, but most areas are under hardwood forest cover. There are at least moderate limitations on this soil for most nonfarm uses. Capability unit VIs–3; woodland group 2o1.

**Laidig very stony loam, 8 to 25 percent slopes** (LaD).—This soil has the profile described as representative for

the series. Locally, there are a few wet spots or wet-weather springs.

Included with this soil in mapping are some areas near the Potomac River where there are spots that lack the fragipan in the lower part of the subsoil and that generally are sandier than the profile described.

This soil has greater limitations for community or other nonfarm uses than the same kind of soil where the slope is less than 15 percent. For grazing and woodland, however, there is little significant difference. Capability unit VIs–3; woodland group 2r1.

## Leetonia Series

The Leetonia series consists of moderately deep, well-drained soils, mostly at very high elevations. These soils formed in material weathered from coarse-grained sandstone. The native vegetation is mixed hardwoods, with a ground cover of laurel and other acid-loving plants.

In a representative profile the surface layer is black sandy loam about 2 inches thick, and the subsurface layer is light-gray sandy loam about 6 inches thick. The subsoil, about 8 inches thick, is dark-red to very dusky red sandy loam; the reddish colors are due primarily to organic matter. The underlying material is sand or loamy sand of various colors. Hard bedrock begins at a depth of about 37 inches. The soil is rapidly permeable.

The Leetonia soils are all very stony and are at higher elevations where the local relief generally is rough. Just downslope from these soils are other soils that are steep, rough, and very stony, and for this reason Leetonia soils generally are not easily accessible. On Leetonia soils the growing season is short. The soils are very acid and generally infertile; therefore, they are not used for farming.

Representative profile of Leetonia very stony sandy loam, 15 to 25 percent slopes, in a wooded area of Dekalb and Leetonia very stony sandy loams, 15 to 25 percent slopes, about 1½ miles west of Foxtown on Dung Hill Road:

A1—0 to 2 inches, black (10YR 2/1) very stony sandy loam; very weak, fine, granular structure; loose; many roots; abundant, light-gray (10YR 7/1), uncoated sand grains; many sandstone fragments, 10 inches in size or larger; very strongly acid; clear, smooth boundary.

A2—2 to 8 inches, light-gray (10YR 7/1) very stony sandy loam; single grain; loose; many roots; many sandstone fragments, 10 inches in size or larger; very strongly acid; abrupt, wavy boundary.

B21h—8 to 10 inches, very dusky red (2.5YR 2/2) channery light sandy loam; weak, medium, granular structure; very friable to loose; many roots; many sandstone fragments, 10 inches in size or larger; extremely acid; abrupt, wavy boundary.

B22h—10 to 16 inches, dark-red (2.5YR 3/6) channery sandy loam; weak, fine, granular structure to massive; very friable to irregularly firm; common roots; many sandstone fragments, 10 inches in size or larger; extremely acid; clear, wavy boundary.

C1—16 to 30 inches, variegated yellowish-brown (10YR 5/4 and 5/8) sand or loamy sand; single grain; loose; very few roots; many sandstone fragments, 10 inches in size or larger; extremely acid; clear, wavy boundary.

C2—30 to 37 inches, variegated very dusky red (2.5YR 2/2), dark reddish-brown (5YR 3/4), and dark yellowish-brown (10YR 3/4) sand; single grain; loose; very few roots; many sandstone fragments, 10 inches in size or larger; extremely acid; abrupt, irregular to broken boundary.

R—37 inches +, very hard, fractured, coarse-grained sandstone.

The solum ranges from about 15 to 25 inches in thickness. The depth to bedrock ranges from about 20 to 40 inches. Leetonia soils in Garrett County are all very stony. Fragments of sandstone, ranging from fine gravel to cobblestones in size, are in most profiles. Fragments of all sizes make up 40 percent or more of the soil, and are commonly more abundant with increasing depth. These soils are naturally very strongly acid to extremely acid throughout.

In the A horizon hue is 10YR or 7.5YR, value is 2 to 7, and chroma is 1 or 2. Value of 2 or 3 is limited to the very thin A1 horizon of undisturbed soils in wooded areas. Low chroma is inherent from the parent material and is maintained, at least in part, by excessive leaching. It definitely is not the result of poor drainage or aeration.

In the B horizon hue is 5YR or redder, value is 2 to 5, and chroma is 2 to 6. The fine material is sandy loam or loamy sand.

The C horizon is variable in hue, is commonly variegated, and has a wide range in value and chroma. It is loamy sand or sand.

Leetonia soils do not resemble any other soils mapped in Garrett County. They formed in parent material similar to that of the well drained Clymer and Dekalb soils, the moderately well drained Cookport soils, the poorly drained Nolo soils, and the very poorly drained Lickdale soils.

Leetonia soils are not mapped separately in Garrett County. They are mapped only with Dekalb soils.

## Lehew Series

The Lehew series consists of moderately deep, well-drained soils that formed in material weathered in place, mainly from red sandstone. The native vegetation is mixed hardwoods, dominantly oak.

In a representative profile which is very stony throughout, the surface layer is reddish-brown loam or channery loam about 7 inches thick. The upper inch of this layer is a little darker in color than the lower part. The subsoil, about 11 inches thick, is also reddish-brown channery loam, but it is slightly brighter in color and has weakly developed blocky structure. The underlying material is light reddish brown and is more sandy than the layers above it. Bedrock begins at a depth of about 29 inches.

Lehew soils are easily worked except where they are too stony, but the coarse fragments are abrasive and can damage equipment. These soils have low available moisture capacity and are low in natural fertility. They are moderately rapidly permeable. The main limitations to farming are low available moisture capacity and fertility, slope and the hazard of erosion, and in large areas, stoniness. The moderate depth over bedrock is a limitation to some other uses.

Representative profile of Lehew channery loam, in a wooded area of Dekalb-Calvin-Lehew very stony loams, 15 to 25 percent slopes, about 3 miles east of Friendsville:

A1—0 to 1 inch, dark reddish-brown (5YR 3/3) channery loam; weak, fine, granular structure; very friable; many roots; about 10 percent small fragments of red sandstone; many red sandstone fragments, 10 inches in size or larger; strongly acid; abrupt, wavy boundary.

A2—1 to 7 inches, reddish-brown (5YR 5/3) channery loam; weak, fine, granular structure; friable; many roots; many red sandstone fragments, 10 inches in size or larger; strongly acid; clear, wavy boundary.

B2—7 to 18 inches, reddish-brown (2.5YR 5/4) channery loam that grades to sandy loam; weak, medium, subangular blocky structure; friable; many roots; many red sandstone fragments, 10 inches in size or larger; very strongly acid; clear, wavy boundary.

C—18 to 29 inches, light reddish-brown (5YR 6/3) very channery sandy loam; single grain; loose to very friable; common roots; about 60 percent coarse fragments of red sandstone, ranging from channers to stone in size; very strongly acid; abrupt, irregular boundary.

R—29 inches +, hard, red, fractured but unbroken sandstone.

The solum ranges from about 15 to 30 inches in thickness. The depth to bedrock ranges from about 20 to 40 inches. Nonstony profiles contain about 20 percent fragments in the A horizon, and all profiles contain 40 to 50 percent or more of coarse fragments of various sizes in the B horizon. Content of coarse fragments is even higher in the C horizon. Unlimed soils are strongly acid to very strongly acid, and acidity commonly increases with increasing depth.

In the A horizon, hue is 10YR to 5YR, value is 3 or 4, and chroma is 1 to 4. Value of 3 is limited to the very thin A1 horizon of undisturbed soils in wooded areas.

In the B horizon, hue is 5YR or 2.5YR, and both value and chroma are 4 to 6. The fine material is loam or sandy loam.

In the C horizon, hue is 5YR or 2.5YR, value is 4 to 6, and chroma is 2 to 4. The fine material is loamy sand or sandy loam.

Lehew soils resemble Calvin and Dekalb soils. They contain more sand in the B and C horizons than Calvin soils. They are distinctly redder in color than the otherwise similar Dekalb soils.

Lehew soils are not mapped separately in Garrett County. They are mapped only with Calvin, Dekalb, and Ungers soils.

## Lickdale Series

The Lickdale series consists of soils that are very poorly drained. These soils are on upland flats and in slight depressions where they formed in material weathered mainly from acid sandstone. The native vegetation is wetland hardwoods, including many willows and alders.

In a representative profile the surface layer is black silt loam about 10 inches thick. The subsoil, about 22 inches thick, is dark grayish-brown silty clay loam in the upper part and gray sandy clay loam in the lower part. It has bright-colored mottles throughout. The underlying material is grayish-brown loamy coarse sand.

Lickdale soils are difficult to work if even a little too wet. They need artificial drainage if used for tilled crops. These soils have high available moisture capacity, and they are slowly permeable. The best management for most crops includes heavy and frequent applications of lime. Lickdale soils are difficult to drain, particularly where outlets are not readily available, as in some depressions. Their use is further severely limited in some areas by stoniness. Erosion generally is not a problem.

Representative profile of Lickdale silt loam, in a nearly level, cultivated area on the north side of Mosser Road, about 1¼ miles east of McHenry:

Ap—0 to 10 inches, black (10YR 2/1) silt loam; weak, fine, granular structure; friable to firm, slightly sticky and slightly plastic; many roots; medium acid (limed); abrupt, smooth boundary.

B21g—10 to 20 inches, dark grayish-brown (10YR 4/2) silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4); weak, medium, blocky and subangular blocky structure; firm, sticky and plastic; many roots in upper part; strongly acid; clear, wavy boundary.

B22g—20 to 32 inches, gray (10YR 5/1) sandy clay loam; common, medium, distinct mottles of yellowish red (5YR 5/6); moderate, coarse, blocky and subangular blocky structure; firm, plastic and very sticky; common roots in upper part; some irregular inclusions of loose sandy materials; strongly acid to very strongly acid; abrupt, wavy boundary.

C—32 to 46 inches, light brownish-gray (10YR 6/2) loamy coarse sand; single grain; loose; strongly acid to very strongly acid.

R—46 inches +, gray to pale-brown weathered sandstone.

The solum ranges from about 24 to 40 inches in thickness. The depth to sandstone bedrock ranges from about 3 to 6 feet. Some soils contain fragments of weathered sandstone, and in places, shale fragments. Some areas of these soils are very stony. Unlimed soils are strongly acid to very strongly acid, and acidity commonly increases with increasing depth.

The A horizon is black, except that in plowed areas the Ap horizon is very dark gray or very dark grayish brown. Even where the soil has been worked or otherwise disturbed, there are at least 10 inches of A horizon that has a color value of 2 or 3 and chroma of 0, 1, or 2.

In the B horizon, the matrix color is in hue 10YR to 5Y or is neutral. The value is 4 to 6 and the chroma is 0 to 2, except that the lower part of the horizon has a chroma of 3 with many low-chroma mottles in places. High-chroma mottles are common to many in the B horizon. They have a hue of 10YR to 5YR, and a value of 4 to 6. The B horizon is silt loam, silty clay loam, or clay loam in the upper part, ranging to sandy clay loam with increasing depth.

In the C horizon, the hue is 10YR or yellower, commonly with high value and low chroma. In some profiles this horizon has high-chroma mottling. The C horizon is sandy clay loam or coarser in texture.

Lickdale soils resemble Elkins soils in color and drainage. They contain more sand in the B horizon than Elkins soils and are shallower to bedrock. Unlike Elkins soils, Lickdale soils do not occur on flood plains. They formed in material weathered from sandstone. Their parent material is similar to that of the well drained Clymer, Dekalb, and Leetonia soils, the moderately well drained Cookport soils, and the poorly drained Nolo soils.

**Lickdale silt loam** (lc).—This soil has the profile described as representative of the series. It is nearly level to depressional, and only a few acres slope as much as 3 percent. Included in mapping are a number of small spots where the surface layer is thinner, lighter in color, or both. Capability unit IVw–2; woodland group 1w2.

**Lickdale very stony silt loam** (ls).—This soil has a profile similar to that described as representative of the series, but is very stony. Fragments 10 inches in size or larger, generally of sandstone, are 30 feet or less apart on the surface, but generally are less abundant in the subsoil. This soil generally is not used for farming, and most of it is in alder or other wetland vegetation. It also furnishes habitat for wetland wildlife. Capability unit VIIs–4; woodland group 1w2.

## Meckesville Series

The Meckesville series consists of deep, well-drained soils that have a weak to moderate fragipan in the lower part of the subsoil. These soils are along the base of slopes where they formed in local colluvial accumulations from reddish shale, siltstone, and some gray to reddish sandstone. The native vegetation is mixed hardwoods, dominantly oak and maple, and scattered hemlock.

In a representative profile the surface layer is dark reddish-gray silt loam about 9 inches thick. The upper part of the subsoil, about 24 inches thick, is reddish-brown heavy silt loam that is somewhat sticky. The lower part of the subsoil, about 11 inches thick, is a reddish-brown, mottled fragipan that is very firm, brittle, and dense. The underlying material is reddish and highly shaly. Bedrock begins at a depth of about 60 inches. The bedrock is not related to the soil profile above it.

Meckesville soils are fairly easy to work, except where they are too stony. The lower part of the subsoil restricts root penetration and the movement of soil moisture, but because it is moderately slowly permeable, these soils are essentially well drained. They have fairly high available moisture capacity. The main limitations to most uses are those imposed by slope and the hazard of erosion. Moderately slow movement of moisture through the lower part of the subsoil and stoniness in places adversely affect some nonfarm uses.

Representative profile of Meckesville silt loam, 0 to 8 percent slopes, in a pasture area on North Glade Road, half a mile east of Glendale Road:

Ap—0 to 9 inches, dark reddish-gray (5YR 4/2) silt loam; moderate, fine, granular structure; friable, slightly sticky; many roots; strongly acid; abrupt, smooth boundary.

B2t—9 to 33 inches, reddish-brown (5YR 4/4) heavy silt loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; common roots; reddish-brown (5YR 5/3), discontinuous clay films; very strongly acid; clear, wavy boundary.

Bx—33 to 44 inches, reddish-brown (2.5YR 5/4) silt loam; common, fine, faint mottles of weak red (2.5YR 5/2); weak, coarse, prismatic and moderate, medium, platy structure; very firm and brittle, slightly sticky and slightly plastic; very few roots; distinct, reddish-brown (5YR 5/3) clay films; about 25 percent disoriented shale fragments; extremely acid; gradual, wavy boundary.

C—44 to 60 inches, variegated weak-red (2.5YR 4/2) and pale-red (2.5YR 6/2) disoriented shale; about 30 percent silty material; loose; extremely acid; abrupt, smooth boundary.

IIR—60 inches +, reddish-brown (2.5YR 5/4) hard sandstone.

The solum ranges from about 40 to 60 inches or more in thickness. The depth to bedrock ranges from 5 to 30 feet or more. The content of coarse fragments smaller than stones ranges from less than 10 percent in the A horizon to more than 50 percent in the C horizon. Large areas are very stony, and colluvial stones are on or near the surface. Unlimed soils are very strongly acid or extremely acid, and acidity commonly increases with increasing depth.

In the A horizon, hue is 7.5YR or 5YR, value is 2 to 5, and chroma is 2 to 4. Value of 2 or 3 is limited to the very thin A1 horizon of undisturbed soils in wooded areas.

In the B horizon, matrix hue is 5YR or 2.5YR, ranging to 10R in the lower part. Value is 3 to 5, and chroma is 3 to 6. Mottles, limited to depths of 30 inches or more, have value of 4 to 6 and chroma of 2 to 8. The B horizon ranges from heavy loam or silt loam to light silty clay loam.

The C horizon has a reddish hue, is commonly variegated, and has a chroma of 4 or less with variable values. The fine material in the C horizon is loam or silt loam.

Meckesville soils do not closely resemble any other soils mapped in Garrett County. They are distinctly redder in color than the otherwise similar Laidig soils. They formed in colluvial parent material similar to that of the somewhat poorly drained to moderately well drained Albrights soils.

**Meckesville silt loam, 0 to 8 percent slopes** (McB).—This soil has the profile described as representative of the series. Most areas have been cleared and are in use. There are a few shallow gullies locally, but in general, this soil has not significantly deteriorated under use.

Included in mapping are areas that have lost a little of the original surface layer.

If relatively simple conservation measures are applied to control erosion, this soil can be used for regular cultivation. Capability unit IIe–4; woodland group 2o1.

**Meckesville silt loam, 8 to 15 percent slopes, moderately eroded** (McC2).—The typical position of this soil on the landscape is such that much seepage and runoff from upslope soils drain or wash across areas of this soil. The erosion pattern is therefore irregular. Rills and small gullies are numerous where there has been the greatest concentration of runoff water.

Included with this soil in mapping are some wooded areas where erosion has had little effect and a few small areas that slope more than 15 percent.

Because of the hazard of further erosion on this soil, tillage is severely limited unless intensive conservation measures are constantly applied. Capability unit IIIe–4; woodland group 2o1.

**Meckesville very stony silt loam, 0 to 8 percent slopes** (MdB).—This soil has a profile similar to that described as representative of the series, except that there are many stones, mostly 10 to 15 inches in diameter, close together on or near the surface. There generally are fewer stones deeper in the profile.

Tillage is not practical, although some hay or pasture is produced. There are moderate limitations for most nonfarm uses. Most of the soil is wooded. Capability unit VIs–3; woodland group 2o1.

**Meckesville very stony silt loam, 8 to 25 percent slopes** (MdD).—This soil has greater limitations for most community and other nonfarm uses than the same kind of soil on gentler slopes. For pasture, hay, or woodland, however, there is little if any difference because of slope. This is a very good soil for wood crops. Under woodland cover it furnishes good watershed protection and wildlife habitat. Capability unit VIs–3; woodland group 2r1.

## Nolo Series

The Nolo series consists of moderately deep to deep, poorly drained soils that have a firm, brittle fragipan in the lower part of the subsoil. These soils are on uplands, where they formed in material weathered in place primarily from sandstone, but also from shale and siltstone. The native vegetation is water-tolerant hardwoods and some hemlock and white pine.

In a representative profile the surface layer is grayish-brown silt loam about 12 inches thick. The upper part of this layer is slightly darker in color than the lower part. The subsoil, about 41 inches thick, is grayish-brown clay loam or light silty clay loam that is mottled with strong brown and other colors. The lower 28 inches of subsoil is a firm and brittle fragipan. Bedrock begins at a depth of about 53 inches.

Nolo soils are easy to work but remain too wet for long periods. Artificial drainage is needed for tilled crops and benefits less intensive uses. The profile is slowly permeable. These soils have moderately high available moisture capacity, but in hot dry seasons they tend to dry out almost completely in the upper part of the profile. Sloping areas are subject to erosion.

Representative profile of Nolo silt loam, 0 to 8 percent slopes, in a pasture on Bumble Bee Road, 1¾ miles northeast of McHenry:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable, slightly sticky and slightly plastic; many roots; slightly gritty; very strongly acid; clear, wavy boundary.

A2—8 to 12 inches, grayish-brown (10YR 5/2) light silt loam; weak, fine, granular structure; friable, sticky and

slightly plastic; common roots; dark grayish-brown (10YR 4/2) silty material in root channels; slightly gritty; very strongly acid; clear, smooth boundary.

B2tg—12 to 25 inches, grayish-brown (10YR 5/2) clay loam or light silty clay loam; common, medium, distinct mottles of strong brown (7.5YR 5/8); weak to moderate, fine, subangular blocky structure; friable, sticky and plastic; many roots in upper part; gritty; faint to distinct, dark grayish-brown (10YR 4/2) clay films; very strongly acid; clear, smooth boundary.

Bx1—25 to 35 inches, grayish-brown (10YR 5/2) clay loam or light silty clay loam; common, medium, distinct mottles of strong brown (7.5YR 5/6); moderate, medium, platy structure; firm and somewhat brittle, sticky and slightly plastic; very few roots; prominent dark grayish-brown (10YR 4/2) clay films; gritty; extremely acid; clear, smooth boundary.

Bx2—35 to 53 inches, gray or light-gray (10YR 6/1) gravelly clay loam; common, coarse, prominent mottles of red (2.5YR 4/6) and yellowish brown (10YR 5/8); moderate, medium, platy structure; firm and brittle, slightly sticky and slightly plastic; very gritty; scattered, very dark grayish-brown (10YR 3/2) clay films; 15 to 25 percent sandstone gravel and some shale; extremely acid; abrupt, wavy boundary.

R—53 inches +, acid, gray sandstone, partly weathered.

The solum ranges from about 40 to 55 inches in thickness. The depth to bedrock ranges from about 3½ to 5 feet. The content of coarse fragments is as much as 10 percent in the A horizon and 35 percent in the lower part of the B horizon. These fragments are mostly angular pieces of sandstone, but there are also scattered stones. Unlimed soils are very strongly acid to extremely acid, and acidity commonly increases with increasing depth.

Throughout the profile, matrix color centers on 10YR but grades to 2.5Y in some horizons. In the A horizon, value is 3 to 6 and chroma is 1 or 2. Value of 3 is limited to the thin A1 horizon of undisturbed soils in wooded areas. The A horizon commonly is gritty with sand.

In the B horizon, matrix value is 4 to 7 and chroma is 1 or 2, ranging to 3 in the upper part of the B horizon of a few profiles. High-chroma mottles in hue 10YR and redder are common throughout the B horizon. The B horizon is loam, silt loam, clay loam, or sandy clay loam. It commonly decreases in silt and increases in sand content with increasing depth.

In some profiles there is a thin C horizon of variable characteristics.

Nolo soils resemble Andover and Brinkerton soils, but they have a coarser textured B horizon than Brinkerton soils and are shallower over bedrock than Andover soils and contain fewer coarse fragments. They formed in material weathered from sandstone similar to the parent material of the well drained Clymer, Dekalb, and Leetonia soils, the moderately well drained Cookport soils, and the very poorly drained Lickdale soils.

**Nolo silt loam, 0 to 8 percent slopes** (NoB).—Most of this soil is very gently sloping, but there are some nearly level areas and there are also some areas that slope as much as 10 percent. There is much seepage in places, and in places the soil receives much runoff from other higher lying soils.

Included in mapping are small minor areas where the surface or plow layer contains a little less silt and more sand than is typical for this soil.

Wetness and erosion on this soil are both problems, but in general, wetness is the more critical problem in soil management for farming and for other purposes. The soil must be artificially drained if it is to be tilled, and drainage benefits other uses. Capability unit IVw–2; woodland suitability group 3w2.

## Peat

Peat, in Garrett County, consists of brown, fibrous, extremely acid, very poorly drained, organic material that is only partly decomposed. On the surface is a thin layer that is more completely decomposed and is black in color. The underlying mineral materials are extremely acid clay and silty clay. There is almost no natural runoff and the water table is at or near the surface for most of the year, except where it has been artificially lowered. The areas support high marsh vegetation consisting mostly of rush and sedge, wild cranberry and other herbs, and some alder.

Peat is only in a few concave depressions in valleys at elevations above 2,500 feet. For the most part, these depressions have had no natural drainage outlets and they remain seasonally ponded for long periods except where artificial drainage outlets are installed.

Representative profile of Peat, under natural vegetation, about six-tenths of a mile west of Glade Church:

Oas—0 to 5 inches, black (10YR 2/1), largely decomposed organic material; very friable; many roots; some recent plant remains; extremely acid; abrupt, smooth boundary.

Oeh—5 to 72 inches, very dark brown (10YR 2/2), partly decomposed organic plant remains, grades to dark yellowish brown (10YR 3/4); very friable; common roots in the upper part only; between 35 and 50 percent fibrous; extremely acid; abrupt, wavy boundary.

IICg—72 to 80 inches, gray (10YR 5/1) clay or silty clay variously streaked with yellowish brown (10YR 5/4); massive; firm to very firm, plastic and very sticky; extremely acid.

The Oas horizon is well decomposed and contains small but variable amount of fibrous material. The Oeh horizon is of partly decomposed materials; there are many remaining plant fibers and little or no mineral matter. The IICg horizon is uniformly dense, massive clayey material that is very slowly permeable.

The Oas horizon is black or nearly so. The Oeh horizon commonly is 10YR in hue but locally is somewhat redder; value and chroma range from 2 to 4. The IIC horizon is gray to light gray or almost white, and is streaked with brownish colors in places. The IIC horizon is less extremely acid in places than the organic horizons above it.

**Peat** (Pe).—This is the only soil in the county that is composed almost entirely of organic materials. It is not used for farming. Some areas have been artificially drained and are being used as commercial sources of peat. The rest remains under natural vegetation.

Included with this soil in mapping are a small number of acres where the black surface layer is considerably thicker than described, and some spots that are only 2 to 3 feet deep over underlying clay.

It may or may not be feasible eventually to use the soil for crops or pasture; it has been only tentatively placed in the capability classification system. It is doubtful if the soil can be used for trees, as there is no natural tree growth, so it has not been placed in a woodland group. Capability unit VIIw–1; not placed in a woodland group.

## Philo Series

The Philo series consists of deep, moderately well drained soils on flood plains. These soils are subject to occasional flooding. The sediment in which they formed was washed originally from areas of acid soils derived

mostly from shale and sandstone. The native vegetation is mostly water-tolerant hardwoods.

In a representative profile the surface layer is dark grayish-brown silt loam about 9 inches thick. The subsoil, about 25 inches thick, is brown or dark-brown silt loam that has distinct gray mottles in the lower part. The underlying material is grayish-brown, mottled, stratified loam or silt loam that has some thin layers of sandy material.

Philo soils are easy to work at a favorable moisture content, but generally they are wet in spring and late to warm up. These soils are especially subject to flooding late in winter and early in spring, so plowing and planting are frequently delayed. Artificial drainage benefits most uses and lengthens the grazing period for pasture. Philo soils are not difficult to drain if adequate outlets are available. These soils have high available moisture capacity, and water moves moderately to moderately slowly through the upper part of the profile. If they have drainage and flood protection, they are suited to many crops. The most important limitations to all uses are seasonal wetness, a high water table, and the hazard of flooding.

Representative profile of Philo silt loam, in a nearly level cultivated area on the flood plain of the Youghiogheny River at Friendsville:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable, slightly sticky; many roots; slightly acid (limed); clear, smooth boundary.

B1—9 to 15 inches, brown or dark-brown (7.5YR 4/4) silt loam; weak, fine and medium, subangular blocky structure; friable, sticky and slightly plastic; many roots; slightly acid; clear, smooth boundary.

B2—15 to 34 inches, brown (10YR 5/3) silt loam; common, medium, distinct mottles of gray (10YR 5/1) and of strong brown (7.5YR 5/6); weak, medium, subangular blocky structure; friable, sticky and slightly plastic; few roots; strongly acid; clear, smooth boundary.

C—34 to 60 inches, grayish-brown (10YR 5/2) loam or silt loam; common, medium and coarse, prominent mottles of strong brown (7.5YR 5/8); stratified with some very thin seams of very sandy material at intervals of 2 to 8 inches; friable to firm, slightly sticky; strongly acid.

The solum ranges from about 20 to 40 inches in thickness. Unconforming bedrock is at depths of more than 6 feet. Waterworn pebbles are in any horizon. Unlimed soils are medium acid to strongly acid, and acidity commonly increases with increasing depth.

Throughout the profile, hue centers on 10YR but grades to 7.5YR or 2.5Y in some horizons. In the A horizon, value is 3 or 4 and chroma is 2 or 3. Value of 3 is limited to the thin A1 horizon of undisturbed soils in wooded areas.

In the B horizon, matrix value is 4 or 5 and chroma is 3 to 6. Mottling has a value of 3 to 6 and a chroma of 1 to 8, with chroma of 2 or less in the lower part of the horizon in all profiles. The B horizon is loam or silt loam.

In the C horizon, matrix value is 4 or 5 and chroma is 1 or 2. Mottling has a value of 4 or 5 and a chroma of 4 to 8. The C horizon ranges from sandy loam to silt loam.

Philo soils do not closely resemble any other soils mapped in Garrett County. They formed in the same kind of sediment as the well-drained Pope soils, the poorly drained Atkins soils, and the very poorly drained Elkins soils.

**Philo silt loam** (Ph).—Most of this soil is nearly level (fig. 6), but there are some areas that have slopes of 3 percent or slightly more. Erosion generally is not a problem, although there is some surface scouring during flood periods.

*Figure 6.*—**The narrow flood plain of Wilson Run, near Oakland. Most of the soil on this flood plain is Philo silt loam.**

Included with this soil in mapping are some small, slightly elevated areas on flood plains where the subsoil is finer in texture and somewhat stickier than is typical for Philo soils. Also included on some flood plains within areas of red soils are small inclusions where the upper part of the subsoil is somewhat reddish brown in color.

Large areas of this soil are flooded infrequently if at all, and many of these are used for corn, hay crops, and improved pasture. Where the flood hazard is severe, cropping is severely limited, and where the hazard is very severe, use is limited almost entirely to grazing and woodland. The risk of flooding in any area must be determined for each individual site, and the best basis for prediction is the recorded history of flooding for each separate area. Capability unit IIw–7; woodland group 1w1.

## Pope Series

The Pope series consists of deep, well-drained soils on flood plains, mostly along the major streams of the county. These soils are subject to temporary flooding during periods of extended heavy rain or of rapid snowmelt. The sediment in which the Pope soils formed was washed originally from areas of acid soils derived mainly from sandstone and shale. The native vegetation is mixed hardwoods, dominantly oak and maple.

In a representative profile the surface layer is dark-brown silt loam about 9 inches thick. The subsoil, about 29 inches thick, is yellowish-brown loam that grades to fine sandy loam in the lower part. The underlying material is brown or light brown and is sandier than the soil and subsoil above it.

Pope soils are easy to work and can be worked early in spring if they are not flooded. It is important in places to intercept and divert runoff water from adjacent higher areas. These soils have high available moisture capacity and water moves through them readily. They respond well to lime and fertilizer. The only limitation to use is the hazard of flooding, but this is an important limitation for some uses.

Representative profile of Pope silt loam, in a nearly level cultivated area on the flood plain of the Youghiogheny River at Sang Run:

Ap—0 to 9 inches, dark-brown (7.5YR 4/2) silt loam; moderate, medium, granular structure; friable, slightly sticky; many roots; slightly gritty; slightly acid (limed); abrupt, smooth boundary.

B21—9 to 20 inches, yellowish-brown (10YR 5/6) loam; weak, medium, granular structure; friable, slightly sticky; many roots; slightly gritty; medium acid; gradual, smooth boundary.

B22—20 to 38 inches, yellowish-brown (10YR 5/6) loam that grades to fine sandy loam with increasing depth; weak, medium, granular and fine subangular blocky structure; very friable, slightly sticky; very few roots; strongly acid; gradual, smooth boundary.

C1—38 to 50 inches, brown (7.5YR 5/4) fine sandy loam; single grain; very friable; very strongly acid; diffuse boundary.

C2—50 to 60 inches, light-brown (7.5YR 6/4) loamy sand; single grain; loose to very friable; few, very fine, waterworn pebbles; very strongly acid.

The solum ranges from about 30 to 50 inches in thickness. Unconforming bedrock is at depths of more than 5 feet. Waterworn pebbles are in any horizon. Unlimed soils are strongly acid to extremely acid, and acidity commonly increases with increasing depth.

Throughout the profile hue is 10YR or 7.5YR. In the A horizon, value is 3 to 5 and chroma is 1 to 4. Value of 3 and chroma of 1 are limited to the thin A1 horizon of undisturbed soils in wooded areas.

In the B horizon, value is 4 to 6 and chroma is 3 to 6. The B horizon is loam, sandy loam, or fine sandy loam. The silt content generally decreases and the sand content increases with increasing depth. The B horizon is less than 18 percent in clay content.

The C horizon has about the same color range as the B horizon, but is variegated or variously mottled in some profiles. The C horizon ranges from loamy sand to sandy clay loam, and is stratified in many places.

Pope soils are the only well-drained soils mapped on flood plains in Garrett County. They formed in the same general kind of sediment on flood plains as the moderately well drained Philo soils, the poorly drained Atkins soils, and the very poorly drained Elkins soils.

**Pope silt loam** (Ps).—This soil is on some of the broader flood plains in various parts of the county.

Included with this soil in mapping are some small areas where the subsoil is reddish brown in color.

Practically no limitations exist for use for farming, except the hazard of flooding. The flood hazard must be determined for each site. Areas that are seldom flooded are mostly intensively used in farming. If the soil is very severely or very frequently flooded, use is limited mainly to woodland or to grazing in flood-free periods. Capability unit I–6; woodland group 2o1.

## Purdy Series

The Purdy series consists of poorly drained soils on old second bottoms or terraces above the Casselman River and its tributaries and a few other major streams. These soils formed in fine-textured old sediment that washed from areas underlain by acid rocks. The native vegetation is oak, maple, hickory, and other hardwoods.

In a representative profile the surface layer is dark grayish-brown, somewhat sticky silt loam about 10 inches thick. The subsoil, about 23 inches thick, is gray or light-gray silty clay or heavy silty clay loam that is mottled with shades of yellowish brown and is sticky to very sticky. The underlying material is dark-gray, mottled, massive silty clay that is very sticky and very plastic.

Purdy soils can be worked only within a fairly narrow range of soil moisture content. They frequently are wet for long periods, especially in spring. Tilled crops need artificial drainage, and drainage improvement benefits hay crops and pasture. These soils have high available moisture capacity, but movement of moisture through the subsoil is slow. There is a hazard of erosion on sloping areas.

Representative profile of Purdy silt loam, 0 to 15 percent slopes, moderately eroded, in a cultivated area about 1¼ miles south of Grantsville:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, coarse, granular structure; friable, slightly sticky and slightly plastic; many roots; slightly acid (limed); abrupt, wavy boundary.

B21tg—10 to 21 inches, gray or light-gray (10YR 6/1) heavy silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4); moderate, fine, blocky and subangular blocky structure; friable to firm, sticky and plastic; many roots; prominent dark yellowish-brown (10YR 4/4) clay films; medium acid; clear, wavy boundary.

B22tg—21 to 33 inches, gray (10YR 5/1) silty clay; common, medium, distinct mottles of yellowish brown (10YR 5/4); moderate, medium, blocky and subangular blocky structure; firm, very sticky and very plastic; few roots; prominent dark yellowish-brown (10YR 4/4) clay films; strongly acid; clear, wavy boundary.

Cg—33 to 68 inches, dark-gray (10YR 4/1) silty clay; common, coarse, distinct mottles of strong brown (7.5YR 5/6) and brown or dark brown (7.5YR 4/4); massive; firm, very sticky and very plastic; very strongly acid.

The solum ranges from about 28 to 40 inches in thickness. Unconforming bedrock is at depths of more than 6 feet. A few waterworn pebbles or cobblestones are in some profiles. Unlimed soils are strongly acid to extremely acid, and acidity commonly increases with increasing depth.

In the A horizon, value is 2 to 5 and chroma is 1 or 2. Value of 2 or 3 is limited to the thin A1 horizon of undisturbed soils in wooded areas.

In the B horizon, matrix color is 10YR to 5Y in hue or is neutral, except that in the lower part of the horizon the hue is 5G or greener in some profiles. Matrix value is 5 or 6, and chroma is 0 or 1. Mottling is in hue 10YR or redder, with a value of 4 to 6 and a chroma of 4 to 8. The B horizon ranges from heavy silty clay loam to clay. This horizon is well above 35 percent in clay content.

The C horizon has about the same range in color as the lower part of the B horizon. The C horizon is commonly as fine in texture as the B horizon, but in many profiles there are thin strata that have higher silt or sand content.

Purdy soils resemble Armagh soils, but have a higher clay content in the B horizon and are consistently deeper over bedrock.

**Purdy silt loam, 0 to 15 percent slopes, moderately eroded** (PuC2).—This soil has the profile described as representative of the series. Most of the soil is sloping, and there have been some losses through erosion.

Included with this soil in mapping are some small areas where the lower part of the subsoil contains less clay than is typical for this series and the subsoil is platy, rather than blocky, in structure. Also included are a few acres where the slope is more than 15 percent.

Improvement of internal drainage on this soil is the most important concern of management. The internal movement of moisture is slow and artificial drainage is fairly difficult, but normally there are adequate outlets for drainage systems. If drainage has been improved, some corn and other crops are grown, but most areas of

this soil are used for hay or pasture. Capability unit IVw–2; woodland group 1w2.

## Stony Land, Steep

Stony land, steep (StF) has slopes of 25 to 100 percent. The soil material between the stones in places resembles soils of several series, but generally it lacks distinct horizonation. In places there are large boulders and outcroppings of hard rock. The stones and rocks are mostly gray, brown, and red sandstone, but there is some shale and siltstone and in places, small areas of limestone. Only a few areas are more than 2 feet deep over hard, almost continuous bedrock. This is the most extensive mapping unit in Garrett County, amounting to nearly 17 percent of the total land area.

Some areas of this land type are used for limited grazing, but most of the acreage is in woodland. Limitations to use are very severe. There is enough fine soil material in most places to produce good yields of wood products from suited trees. The steepness of many areas severely limits some management operations on woodland, particularly the planting of seedlings and the harvesting of timber or other woodland products. This land type furnishes excellent watershed protection and habitat for some kinds of wildlife. Capability unit VIIs–3; woodland group 2f1 (north aspects) or 3f1 (south aspects).

## Strip Mines and Dumps

Strip mines and dumps (St) include areas that contain open pits from which the overburden of soil and rock has been removed to expose seams of coal for mining. Next to these, in nearly all places, are the spoil areas and gob piles where the removed overburden was deposited during stripping operations. In many areas the overburden has been used to partly refill the pits and strip areas. Some places have been graded into somewhat natural-looking topography.

These areas are not shown separately on the maps, partly because any area might be in one condition at one time and in an entirely different condition a few months later. Only the refilled and graded areas have any immediate use for farming, and such use generally is limited to grazing. Some such areas have been replanted to trees, and some are sites for other uses. Only a detailed onsite investigation can reveal the exact surface and subsoil conditions for a projected use. Capability unit VIIs–5; not placed in a woodland group.

## Swamp

Swamp (Sw) consists of land that stands under water for long periods during the year. The soil material is unclassified. It may be silt, clay, sandy materials, muck, peat, or a mixture of these. All of the areas are subject to overflow from streams, or they are along the edges of lakes or other water impoundments. Some areas contain many stones and boulders.

This land type is not used for farming. It is difficult, if not impractical, to drain. Most areas support some kinds of wetland trees, but they furnish few, if any, wood crops. They also provide food and cover for some kinds of wildlife. Capability unit VIIw–1; not placed in a woodland group.

## Ungers Series

The Ungers series consists of deep, well-drained soils on uplands. These soils formed in material weathered from red or reddish shale, sandy shale, and fine-grained sandstone. The native vegetation is mixed upland hardwoods, dominantly oak and maple, and some Virginia pine and white pine.

In a representative profile the surface layer is reddish-brown channery loam about 8 inches thick. The subsoil, about 32 inches thick, is dusky-red, rather sticky silt loam or heavy loam. This subsoil lies directly on red to reddish-brown bedrock of sandy shale.

Ungers soils are easy to work, but the coarse fragments are abrasive to farm implements. The available moisture capacity is moderate, but it generally is somewhat greater than for similar soils of the Garrett County uplands. The profile is moderately permeable. These soils are limited mainly by slope and the hazard of erosion for use for farming, but the moderate depth over bedrock limits some nonfarm uses.

Representative profile of Ungers channery loam, in a cultivated area of Ungers, Calvin and Lehew channery loams, 0 to 10 percent slopes, about 2¼ miles south of Piney Grove on Lonaconing Road:

Ap—0 to 8 inches, reddish-brown (2.5YR 4/4) channery loam to silt loam; weak to moderate, fine, granular structure; friable; many roots; strongly acid; abrupt, smooth boundary.

B21—8 to 20 inches, dusky-red (10YR 3/3) silt loam; moderate, medium, subangular blocky structure; friable, slightly sticky; common roots; fewer channers than in Ap horizon (about 10 percent); strongly acid; gradual, wavy boundary.

B22t—20 to 40 inches, dusky-red (10YR 3/3) heavy loam; moderate, medium, subangular blocky structure; friable, sticky and slightly plastic; common roots; thick continuous clay films; about 10 percent coarse fragments; very strongly acid; abrupt, wavy boundary.

R—40 inches +, red to reddish-brown sandy shale, fractured.

The solum ranges from about 30 to 45 inches in thickness. The depth to bedrock ranges from about 48 to 60 inches. The solum contains as much as 20 percent flattened rock fragments that are as much as 6 inches in length. Unlimed soils are strongly acid to extremely acid, and acidity commonly increases with increasing depth.

In the A horizon, hue ranges from 7.5YR to 2.5YR, value is 3 or 4, and chroma is 2 to 4.

In the B horizon, hue is commonly at least 2.5 units redder than in the A horizon and in most profiles is 2.5YR or 10R. The value is 3 or 4 and the chroma is 3 to 6. The B horizon ranges from heavy loam to light silty clay loam. The clay content of the B horizon averages between 20 and 30 percent, which is 5 to 10 percent more than that in the A horizon.

The color value of 3 in either the A or B horizon apparently is inherited from the parent material and is not due to organic-matter content or to other products of the soil-forming process.

Some profiles have a thin C horizon between the B horizon and the R horizon, which has the same color range as the B horizon but is loam or sandy loam in texture. The C horizon commonly contains many rock fragments.

Ungers soils resemble Calvin, Lehew, and Meckesville soils in color and in drainage. They have a distinct Bt horizon that is lacking in Calvin and Lehew soils and do not have the fragipan that is characteristic of Meckesville soils.

**Ungers, Calvin and Lehew channery loams, 0 to 10 percent slopes** (UcB).—This mapping unit consists of nearly level to gently sloping channery loams of the three named series on uplands, generally on broad ridgetops. It includes the sites of the profiles representative of both the Ungers and Calvin series. These soils are not complexly mixed, and a single delineation on the soil map generally includes only one, or in places two, of the different soils. The Ungers soil makes up about 55 percent of the total land area of the unit, Calvin soil about 35 percent, and Lehew soil about 10 percent.

The soils of this unit are essentially the same as in the Calvin, Ungers and Lehew channery loams described in the Calvin series, but are in different proportions on the landscape. This mapping unit is dominated by the Ungers soil instead of the Calvin soil on these gentle slopes. All of these soils are essentially red in color. The Ungers soil has a well-developed, somewhat clayey subsoil, which the Calvin and Lehew soils do not have. They contain fewer rock fragments than Calvin and Lehew soils. The Calvin and Lehew soils are similar except that the Lehew soil is sandier than the Calvin soil and contains less clay and silt.

These soils are well suited to the crops commonly grown in the county. Although these soils do not retain large amounts of moisture for plants, the moderate hazard of erosion is the most important concern affecting use and management in farming. Capability unit IIe–10; woodland group 3f1.

**Ungers-Gilpin-Calvin channery loams, 0 to 10 percent slopes** (UnB).—This mapping unit consists of nearly level to gently sloping channery loams on uplands, generally on broad ridgetops. These soils generally are complexly mixed on the landscape, and any delineation on the map normally includes all three kinds of soil. The Ungers soil occupies about 45 percent of the total land area of the unit, the Gilpin soil about 35 percent, and the Calvin soil about 20 percent.

The soils of this unit are essentially the same as in the Calvin-Gilpin-Ungers channery loams described in the Calvin series, but are in different proportions on the landscape. This mapping unit is dominated by the Ungers soil instead of the Calvin soil on these gentler slopes. The Ungers and Calvin soils are reddish in color, and the Gilpin soil is dominantly brown. The Ungers and Gilpin soils have a more strongly developed subsoil than that of the Calvin soils and contain fewer rock fragments.

Included with these soils in mapping are a few small areas similar to the Calvin soils, except that they are more brown than red in color.

The moderate hazard of erosion is the most important concern affecting use and management of these soils. Fairly simple, rather easily applied and maintained conservation measures adequately protect these soils for regular cultivation. Capability unit IIe–10; woodland group 2o1.

## Very Stony Land

These land types are so stony and bouldery, contain so many outcrops of rock, and are so rough that their use is very severely limited. Between 50 and 90 percent of the surface is occupied by stones and boulders or by small outcroppings of bedrock. Most of these areas are gray to yellowish to reddish-brown hard sandstone, but some are siltstone or massive shale. Scrub-type hardwoods occupy most areas, but locally there are some trees of commercial size and species. In many places there is a sparse undergrowth of laurel, rhododendron, and other acid-loving shrubs.

**Very stony land, rolling** (VsD).—The slope of this land type is as much as 25 percent in places. Although this land type is not well suited to forest, some woodland products can be harvested, but yields are not high. Growth of young trees is slow, and returns are small. However, this land generally is ideally situated for watershed protection. It also furnishes some food and excellent cover for deer and other wildlife. Capability unit VIIIs–1; woodland group 5x1.

**Very stony land, steep** (VsF).—Slopes range from about 25 percent to more than 100 percent in places. Little economic return from woodland products can be expected. This land type is suitable for wildlife habitat or watershed protection. Capability unit VIIIs–1; woodland group 4x1 (north aspects) or 5x1 (south aspects).

## Wharton Series

The Wharton series consists of deep, moderately well drained soils on uplands. These soils formed in material weathered from soft, fine-grained shale and fire clay. The native vegetation is mixed hardwoods, dominantly oak, maple, and hickory.

In a representative profile the surface layer is dark grayish-brown silt loam about 7 inches thick. The subsoil, about 32 inches thick, is yellowish-brown, sticky silty clay that is mottled with gray or light gray in the lower part. The underlying material is very pale brown, massive silty clay that is also mottled with gray or light gray. Clay shale bedrock begins at a depth of about 47 inches.

Uneroded Wharton soils are not difficult to work, except when they are too wet or too dry. As the effects of erosion become more severe, plowing to normal depth turns up more of the sticky, heavy subsoil, and plowing and tilling become more difficult. Artificial drainage benefits cultivated crops, particularly on the more nearly level areas. Drainage is difficult in places because water moves slowly through the subsoil. The naturally impeded drainage of these soils limits their use for some nonfarm purposes. Bedrock generally is not an important limitation to any use, because it is fairly easy to excavate by conventional means.

Representative profile of Wharton silt loam, 0 to 10 percent slopes, moderately eroded, in a cultivated area on Fearer Road, at Sand Spring:

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

B21t—7 to 19 inches, yellowish-brown (10YR 5/6) silty clay; moderate, medium, blocky structure; firm, sticky and plastic; common roots; thin, distinct clay films; strongly acid; clear, wavy boundary.

B22t—19 to 39 inches, light yellowish-brown (10YR 6/4) silty clay; few, medium, distinct mottles of gray or light gray (10YR 6/1); moderate to strong, medium, blocky structure; very firm, sticky and plastic; few roots; distinct, dark yellowish-brown (10YR 4/4)

clay films; very strongly acid; gradual, wavy boundary.

C—39 to 47 inches, very pale brown (10YR 7/4) silty clay, strongly variegated with gray or light gray (10YR 6/1); massive; very firm, plastic and very sticky; very strongly acid; abrupt, irregular boundary.

R—47 inches +, very pale brown (10YR 7/4) fractured clay shale, stained or coated with brown or dark brown (7.5YR 4/4).

The solum commonly is a little less than 40 inches thick. The depth to bedrock ranges from about 3½ to 6 feet. Soft clay shale fragments are in the lower part of the B horizon and in the C horizon of some profiles. There are a few widely spaced stones of harder clay shale. Unlimed soils are strongly acid to very strongly acid in the solum and very strongly acid to extremely acid in the C horizon. Acidity commonly increases with increasing depth.

In the A horizon, value is 3 to 5 and chroma is 1 to 4. Value of 3 and chroma of 1 are limited to the thin A1 horizon of undisturbed soils in wooded areas.

In the B horizon, matrix hue is 10YR or 7.5YR, with a value of 5 or 6 and a chroma of 4 to 6. The lower part of the B horizon has mottles with chroma of 2 or less, and in many profiles it has high-chroma mottles also. The B horizon ranges from heavy silty clay loam to clay. Its clay content is about 35 to 50 percent.

In the C horizon, the matrix hue is 10YR or 2.5Y, with a value of 4 to 7 and a chroma of 1 to 4. The C horizon has contrasting mottles in most profiles. It ranges from silt loam to clay in texture; the finer textures are dominant in most soils.

Wharton soils do not closely resemble any other soils mapped in Garrett County. They differ from all other moderately well drained soils in that they do not have a fragipan in the lower part of the subsoil, or their subsoil is finer in texture and not as permeable. They formed in clay shale material similar to the parent material of the somewhat poorly drained Cavode soils and the poorly drained Armagh soils.

**Wharton silt loam, 0 to 10 percent slopes, moderately eroded** (WhB2).—This soil has the profile described as representative of the Wharton series. Surface water penetrates through the soil so slowly that much of it runs off, and erosion results unless appropriate control measures are installed and maintained. The soil is wet in spring, and artificial drainage is needed, particularly on the more nearly level areas, unless planting is to be delayed. Drainage also benefits most other uses.

Included with this soil in mapping are a few wooded areas that have been little affected by erosion.

If drainage is applied as needed, and erosion is controlled, the soil is suitable for continued regular use for crops, hay, and pasture. Capability unit IIe–13; woodland group 2w1.

**Wharton silt loam, 10 to 20 percent slopes, moderately eroded** (WhC2).—All areas of this soil except some included woodlands have lost a few inches of the friable silt loam surface layer, and plowing turns up enough subsoil so that freshly plowed fields appear to be spotted with yellow. In a few places the subsoil has been exposed, and some gullies cut the areas.

Included with this soil in mapping are a few areas that slope more than 20 percent.

This soil needs intensive soil and water conservation and management if it is to be kept in suitable condition for continued cropping. Capability unit IIIe–13; woodland group 2w1.

# *Use and Management of the Soils*

The first part of this section explains how soils are grouped according to their capability in farming and describes the capability units in Garrett County. The second part deals with practices of management that are suitable for all the soils of the county. The third part gives estimates of the yields of common crops grown under a high level of management. In addition, this section discusses the use of the soils as woodland and wildlife habitat and in engineering and community development.

## 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 rice, cranberries, 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 range, for forest trees, or for engineering.

In the capability system, the kinds of soil 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 subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife habitat. (None in Garrett County)

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

Class VII soils have very severe limitations that make them unsuited to cultivation and that re-

strict their use largely to pasture or range, 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, range, 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. Capability units are 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.

In the following pages the capability units in Garrett County are described, and suggestions for the use and management of the soils are given. The numbers of the capability units within each subclass are not consecutive, because not all units within the statewide system are represented in Garrett County.

The soil series represented in each unit are named, but this does not mean that all the soils of the series are in the unit. To find the unit in which a given soil has been placed, refer to the "Guide to Mapping Units" at the back of this survey.

#### CAPABILITY UNIT I–6

The only soil in this unit is Pope silt loam, a deep, well-drained, nearly level soil that has medium texture.

Infrequent flooding is a hazard in some areas of this soil. The existence of such a hazard in a particular area can be determined only by local history and experience. Otherwise, there are no limitations on the use of the soil for general farming.

This soil is well suited to corn, general crops, and pasture and is highly productive under good management. Most areas lack the good air drainage necessary for orchards, however, and early truck crops, as well as winter small grain, may be damaged in areas that are subject to flooding. Minimum tillage and good management of crop residue are among the practices most needed. In places stream channels need improvement, and streambanks need to be stabilized.

#### CAPABILITY UNIT IIe–4

This unit consists of soils of the Clymer and Meckesville series. These are moderately deep to deep, medium-textured, well-drained, nearly level to gently sloping soils on uplands and foot slopes. Most areas of these soils are moderately susceptible to erosion. The available moisture capacity is moderate to high.

The soils of this unit are well suited to general crops, forage crops, truck crops, pasture, and orchards. Air drainage generally is adequate. Control of erosion is not difficult but is necessary where clean-tilled crops are grown. Contour tillage, stripcropping, a suitable cropping system, minimum tillage, and the full use of crop residue are practices that help to reduce runoff and control erosion.

#### CAPABILITY UNIT IIe–5

The only soil in this unit is Allegheny fine sandy loam, 0 to 8 percent slopes. The soil is nearly level to gently sloping, and is deep and well drained. The plow layer is moderately coarse textured, and is easier to work than the plow layer of less sandy soils. The available moisture capacity is high, and there is a moderate hazard of erosion.

The soil of this unit is especially well suited to truck crops, as well as to general crops, forage crops, pasture, and orchards. Air drainage generally is adequate. The full use of crop residue is especially desirable on this soil because of its somewhat sandy nature. Contour tillage, contour stripcropping, a suitable cropping system, and minimum tillage are other practices that help to reduce runoff and control erosion.

#### CAPABILITY UNIT IIe–10

This unit consists of nearly level to gently sloping soils of the Calvin, Dekalb, Gilpin, Lehew, and Ungers series. These are mostly moderately deep, medium-textured, well-drained soils on uplands. Slopes are no more than 10 percent, and the soils are moderately susceptible to erosion. The available moisture capacity is low to moderate.

The soils of this unit are suited to most common crops, and are well suited to sodded orchards. Because they are only moderately deep over bedrock, these soils are somewhat limited in their capacity to supply moisture to growing plants during extended dry periods. However, they are among the most intensively cropped soils in the county (fig. 7). Contour tillage and stripcropping, minimum tillage, and a suitable cropping system are effective in helping to control erosion. Good management of crop residue not only helps to control erosion, but it facilitates the entry of surface water into the soil, thus reducing runoff and adding to the moisture supply of the soil.

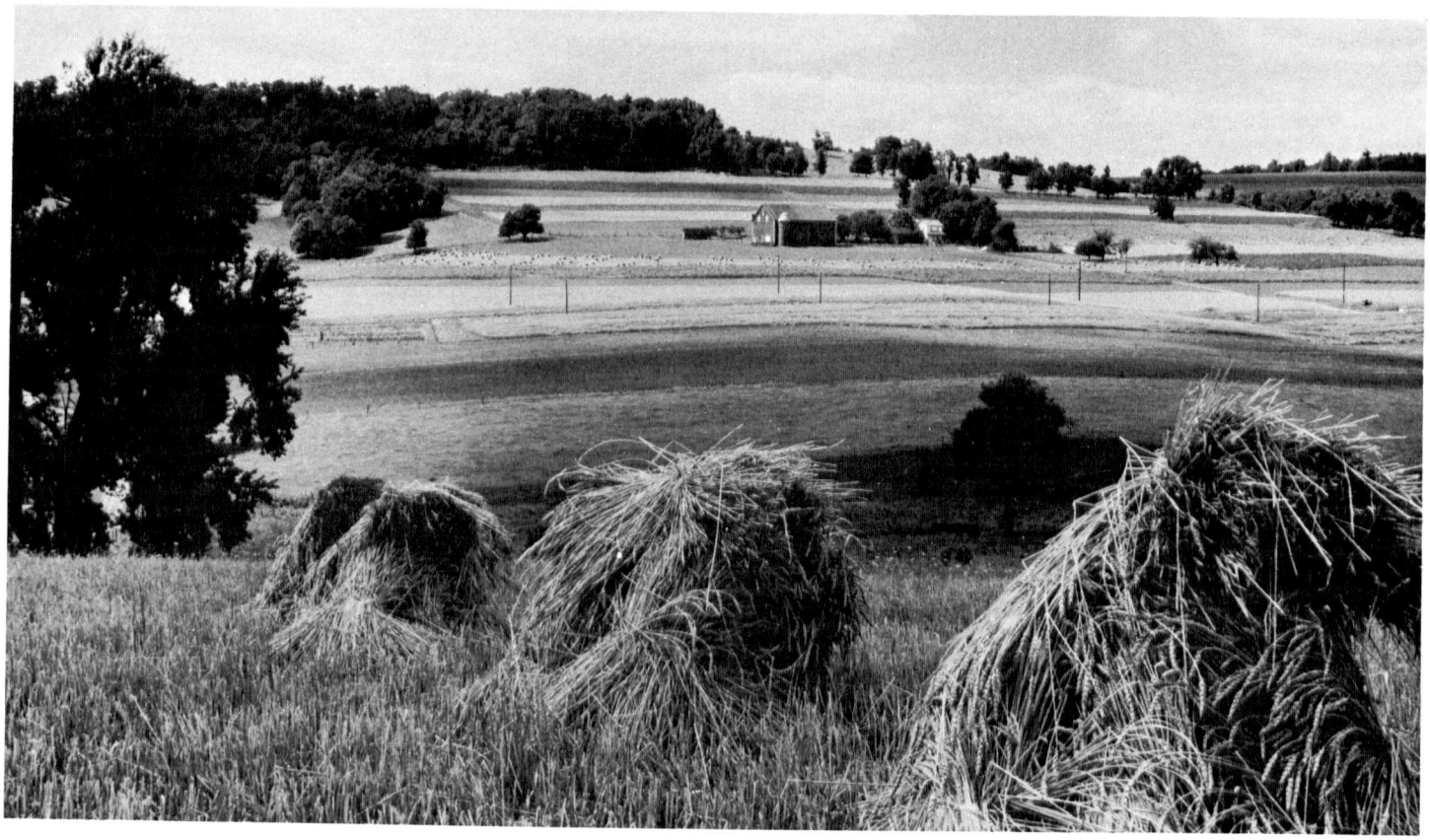

*Figure 7.*—**Intensive use of soils in capability unit IIe–10, near Accident.**

#### CAPABILITY UNIT IIe–13

This unit consists of nearly level to gently sloping soils of the Albrights, Cookport, Ernest, and Wharton series. These soils have a medium-textured plow layer, and are moderately well drained to somewhat poorly drained. The subsoil either contains a dense, tough fragipan or it consists of heavy silty clay. This strongly restricts the vertical movement of subsoil moisture, so in wet seasons the soil layers nearer the surface frequently are saturated with water. Conversely, during prolonged dry seasons the surface layers become almost completely dried in places.

Seasonally excess water is a limitation, especially in spring, and planting dates may be delayed. Nevertheless, controlling soil loss generally is more important than improving drainage. If erosion is controlled and drainage is improved, the soils are well suited to corn, some hay crops, late truck crops, and pasture. They are not well suited to crops that are damaged by frost heaving.

#### CAPABILITY UNIT IIw–3

The only soil in this unit is Ernest silt loam, 0 to 3 percent slopes. This soil is nearly level, medium textured, moderately well drained, and has a moderately slowly permeable subsoil that contains a fragipan. Water enters and moves through the soil slowly.

The soil of this unit is fairly easy to work at a favorable moisture content, but it tends to be wet until late in spring. Drainage generally is the most important concern in management. If drainage is improved and the soil is otherwise well managed, the soil is suited to many crops, including late truck crops and pasture. It is not well suited to crops that are damaged by frost heaving. Seasonally excess water can be removed by properly spaced tile lines or V-type ditches.

#### CAPABILITY UNIT IIw–7

The only soil in this unit is Philo silt loam. This soil is moderately well drained, is nearly level and medium textured, and is on flood plains in many parts of the county. It has a seasonal high water table, and in many places is subject to infrequent flooding.

If drainage is improved, this soil is suited to many crops, although planting of some crops may be delayed by wetness or by the threat of spring floods. V-type ditches or tile lines are used to improve drainage where adequate outlets are available. In places it is necessary to intercept and divert runoff water from adjacent higher lying areas. The main channels of streams need to be kept clean, and in places they need to be deepened and straightened. Much of the acreage of this unit is in pasture. Where the soil is frequently or severely flooded, most commonly where there are channel obstructions, the soil is mostly in woodland.

#### CAPABILITY UNIT IIIe–4

The only soil in this unit is Meckesville silt loam, 8 to 15 percent slopes, moderately eroded. This soil is deep, medium textured, and well drained, and is moderately sloping and moderately eroded. It is highly susceptible to further erosion.

The soil of this unit is suited to most crops commonly

grown in the county, but intensive erosion control measures are necessary if the soil is used for tilled crops. Effective erosion control measures include minimum tillage, stripcropping, planting on the contour, buffer strips, and diversion terraces that have well-sodded waterways. Especially helpful also are cropping systems that include legumes and other cover and green-manure crops, particularly when combined with good residue management.

#### CAPABILITY UNIT IIIe-10

This unit consists of moderately sloping to strongly sloping soils of the Calvin, Dekalb, Gilpin, Lehew, and Ungers series. These are mostly moderately deep, medium-textured, well-drained soils on uplands, although the Ungers soils are deeper soils. Most of the acreage of this unit has been moderately eroded, and because slopes range from about 10 to 20 percent, the hazard of further erosion is severe.

The soils of this unit are used for nearly all common crops and for pasture. Available moisture capacity is low to moderate. Crops are better grown in a suitable rotation with cover crops, and planted in strips of suitable width on the contour. If runoff water is diverted to sodded strips, most of it can be absorbed by the soils. Any excess water can be disposed of through well-sodded waterways that lead to carefully prepared outlets. Supplemental irrigation is of value in dry periods. Overgrazing pasture destroys the protective sod.

#### CAPABILITY UNIT IIIe-13

This unit consists of moderately sloping to strongly sloping soils of the Albrights, Cookport, Ernest, and Wharton series. These soils are medium textured and are moderately well drained to somewhat poorly drained. The subsoil either contains a dense, tough fragipan or it consists of heavy silty clay. This restricts the vertical movement of subsoil moisture. During prolonged dry seasons the surface layer dries out almost completely, whereas in wet seasons the surface layer is almost completely saturated. The soils of this unit have been moderately eroded, and there is a severe hazard of further erosion. Surface water runoff is greater on these soils than on soils of this slope range that have a more readily permeable subsoil.

Control of erosion is a much more important concern in management than is drainage. The soils may not need drainage improvement for some crops, particularly late-planted crops and forage and pasture plants. Cropping systems need the use of contour strips, and excess runoff water needs to be diverted into well-sodded waterways that have carefully prepared outlets. Spot drainage, by tile or by shallow ditches, is useful in places. These soils are not well suited to crops that are damaged by frost heaving.

#### CAPABILITY UNIT IIIe-34

The only soil in this unit is Cavode silt loam, 8 to 15 percent slopes, moderately eroded. This soil is somewhat poorly drained and has a clayey, mottled, sticky subsoil through which water moves slowly. It ranges from moderately deep to deep over bedrock. There is a severe hazard of further erosion if the soil is tilled.

This soil is difficult to drain. V-type ditches, properly spaced and arranged in relation to the slope of the land, help to remove excess water. Even if drainage has been improved, many crops are best planted late, as the soil is slow to warm up and it is difficult to till if it is only slightly wet. This soil is used in farming mostly for hay crops and pasture, but some other crops are grown. To help control erosion, row crops are better planted and tilled in strips on the contour.

#### CAPABILITY UNIT IIIw-5

The only soil in this unit is Cavode silt loam, 0 to 8 percent slopes. This soil is somewhat poorly drained, has a clayey, mottled, sticky subsoil through which water moves slowly, and is moderately deep to deep over bedrock. It is nearly level to gently sloping. For this reason, erosion is usually no more than a minor concern, but the soil is wet so much of the time that drainge is the most important concern in soil use and management.

This soil is difficult to drain. A system of V-type ditches or tile, properly designed, installed, and maintained, helps to remove much of the excess water. Tile drains generally do not function well if placed too deep. Most crops are better planted late, even where drainage has been improved, because the soil is difficult to till if only slightly wet, and because it is slow to warm up in spring. The soil is used mostly for corn, pasture, and some hay crops. It is poorly suited to alfalfa, overwintering small grains, or other plants that are damaged by frost heaving.

#### CAPABILITY UNIT IIIw-7

This unit consists of soils of the Atkins and Elkins series. These are nearly level, poorly drained to very poorly drained, medium-textured soils on flood plains.

In areas that are not frequently flooded, these soils are used for corn and pasture if drainage is artificially improved, but they are rarely used for hay or for small grain. Drainage can be improved by using V-type ditches or tile lines if adequate outlets are available. Where flooding is frequent or severe, the use of these soils is almost entirely limited to woodland. The hazard of flooding can be reduced in some areas by cleaning, deepening, and straightening stream channels. Streambanks need also to be stabilized.

#### CAPABILITY UNIT IVe-9

The only soil in this unit is Ernest silt loam, 15 to 30 percent slopes, moderately eroded. This soil is strongly sloping to steep. A severe hazard of further erosion exists if the soil is tilled. It is moderately well drained and has a fragipan in the lower part of the subsoil. Control of erosion is a much greater concern in management than is drainage.

This soil generally is poorly suited to tilled crops. Cultivation needs to be on the contour, in narrow strips, and in long rotations that include sod crops or other close-growing vegetation. This soil is better suited to hay crops or pasture. It is not well suited to plants that are damaged by frost heaving, and it is seldom used for orchards. Drainage is not necessary for most uses, but runoff and seepage water need to be intercepted and diverted into sodded channels that have adequate, safe outlets.

CAPABILITY UNIT IVe–10

This unit consists of strongly sloping to steep soils of the Calvin, Dekalb, Gilpin, Lehew, and Ungers series. These are mostly moderately deep, medium-textured, well-drained soils on uplands, although the Ungers soils are deeper. There is a severe hazard of further erosion if the soils are tilled.

An occasional tilled crop can be grown safely on these soils if it is planted in narrow strips on the contour, and if all other appropriate measures are used for controlling erosion. Safer uses are hay, carefully managed pasture, or sodded orchards that are grown on the contour. Runoff is rapid on these soils, and even under the best conditions they do not store much moisture for the use of plants.

CAPABILITY UNIT IVw–2

This unit consists of nearly level to moderately sloping soils of the Andover, Armagh, Brinkerton, Lickdale, Nolo, and Purdy series. These soils are poorly drained to very poorly drained and have a slowly permeable subsoil. Some of these soils are gently to moderately sloping. Small areas have been affected by erosion.

Drainage is the most important concern in management and is necessary if the soils are to be tilled. Ditches generally provide the best means for draining these soils, although tile lines function fairly well in areas of Andover, Brinkerton, Lickdale, and Nolo soils. Even with good artificial drainage, these soils are slow to dry out and warm up in spring, and consequently, planting of crops is later than on most soils of the county. Corn is the principal cultivated crop. The soils are not suited to plants that are damaged by frost heaving. Most cleared areas are used for hay or pasture. Many areas are occupied by stands of water-tolerant trees and other plants. In addition to artificial drainage, these soils need protection from runoff from adjacent higher lying areas.

CAPABILITY UNIT VIe–3

This unit consists of strongly sloping to steep soils of the Calvin, Ungers, Lehew, and Gilpin series. These soils are mostly moderately deep and well drained. Slopes range from about 20 to 35 percent, and practically all areas have been severely eroded. The hazard of further erosion is too severe to justify any clean tillage.

Cleared areas generally are in pasture or are idle. Even those areas that are wooded were once mostly cleared and then abandoned to natural reforestation. Any areas now in woodland cover are better left wooded unless specifically needed for some more intensive use. Pasture can be established in some areas, but it cannot have a very great carrying capacity. Overgrazing needs to be carefully avoided. Controlling weeds and brush in pastures is difficult in places and in some areas must be done by hand or by chemicals. Unused areas are better reforested to furnish watershed protection and wildlife habitat.

CAPABILITY UNIT VIw–1

This unit consists only of Alluvial land. This miscellaneous land type consists of unclassified soil materials on flood plains of streams and rivers, where it is subject to frequent and sometimes severe flooding. The soil materials are highly variable in texture and origin, generally are gravelly, and are mostly poorly drained.

Wetness and flooding generally preclude cultivation of these soils. Many areas are suited to grazing, at least on a seasonal basis, and grazing can be improved by seeding, judicious liming and fertilizing, and controlling weeds and brush. Otherwise, particularly in areas that may be especially susceptible to flooding, the most intensive suitable use is for wetland trees. Some areas can be improved by cleaning, deepening, and straightening of stream channels. Probable benefits, however, may not justify cost.

CAPABILITY UNIT VIs–3

This unit consists of nearly level to strongly sloping, very stony soils of the Albrights, Cookport, Ernest, Laidig, and Meckesville series. These soils are somewhat poorly drained to well drained, and water moves through the subsoil slowly. Slopes range to about 25 percent. The stones on and in the soil are abundant; most are sandstone more than 10 inches in diameter. They effectively prevent tillage by any modern means.

These soils can be used for pasture or for limited production of hay, but either of these uses requires that the soils be partly cleared of stones, limed and fertilized, and seeded with appropriate pasture plants. After the pasture is established, grazing needs to be carefully managed. Control of weeds and brush is difficult because of stones. Selected areas can be used for sodded orchards. Wooded areas are better left in trees, unless specifically needed for some more intensive use. Some areas can be reforested.

CAPABILITY UNIT VIs–4

This unit consists of nearly level to strongly sloping, very stony soils of the Dekalb, Calvin, Gilpin, Leetonia, and Lehew series. These soils are well drained, are very acid, and have slopes ranging to about 25 percent. They differ from soils of capability unit VIs–3 in that they generally are less fertile and retain less moisture for plants, although they are better drained. Stones are abundant; most are acid sandstone more than 10 inches in diameter. They effectively prevent tillage by any modern means.

These soils can be used for pasture or for limited hay production, but even under the best management, yields generally are low. They are better suited to partly improved grazing, generally without stone removal or brush control. Wooded areas are better left in trees. Some areas can be reforested to furnish watershed protection, wildlife habitat, and moderate wood crop products.

CAPABILITY UNIT VIIe–3

This unit consists only of Calvin and Lehew channery loams, 35 to 50 percent slopes. Most of these soils have not been cleared or cultivated. The hazard of erosion is so severe that cultivation is neither safe nor feasible.

Grazing, even under the most intensive good management, is severely limited. Most of the cleared acreage needs to be reforested. Areas now in trees are better left in woodland to furnish watershed protection, wildlife habitat, and some wood crop products. Livestock should be kept out of wooded or reforested areas.

CAPABILITY UNIT VIIw–1

This unit consists of two miscellaneous land types, Peat and Swamp. Peat consists of upland bog deposits of

decayed plant materials. Swamp is permanently wet land that supports some trees but mostly supports grass, sedge, and brush, including alder and willows.

Reclamation of these land types for farming is of questionable value, but some areas are a source of marketable peat. Some areas of Swamp are used for commercial timber, but woodland management, especially planting, does not bring favorable returns. The principal use of these lands is for wildlife habitat.

#### CAPABILITY UNIT VIIs-3

This unit consists entirely of Stony land, steep. Slopes range from 25 percent to as much as 100 percent. The land is much too stony for tillage, but there is enough soil material between the stones to support good woodland growth. Wooded areas furnish watershed protection, wildlife habitat, and outdoor recreation. Timber operations or tree farming generally are not feasible on the steeper slopes.

#### CAPABILITY UNIT VIIs-4

This unit consists of nearly level to moderately sloping, very stony soils of the Brinkerton, Andover, and Lickdale series, and the miscellaneous land type Alluvial land, very stony. In addition to being very stony, these areas are poorly drained to very poorly drained, are wet much of the time, and in some areas are seasonally flooded. Artificial drainage is not feasible, so the soils are not suited to cultivation or to improved pasture. They are suited to wetland forest. Management and harvesting of woodland is difficult in most seasons. The woodlands furnish good habitat for some kinds of wildlife.

#### CAPABILITY UNIT VIIs-5

This unit consists only of the miscellaneous land type Strip mines and dumps. The acreage increases as mining operations continue. Some areas have been smoothed and reclaimed, and others have not. This land type generally is not suited to cultivation. Some reclaimed areas may furnish reasonably good grazing, others may produce some wood crops after reforestation, and still other areas produce nothing at all. Onsite examination of each area is necessary for more specific evaluation for a given use.

#### CAPABILITY UNIT VIIIs-1

This unit consists entirely of Very stony land. This land type is not suited to farming. Slopes are as much as 100 percent or more. The areas support shrubs, small trees, and some larger trees. Some woodland products can be harvested from the lower slopes, but neither woodland management nor tree farming is feasible. Some areas furnish extremely limited grazing or browsing. This land type is suited to trees for watershed protection, wildlife habitat, and outdoor recreation.

## General Management Requirements

Some of the management practices needed to obtain a good growth of crops and, at the same time, conserve soil and water can be conveniently summarized for all soils of the county. Among these practices are the drainage of wet soils, irrigation of soils in dry periods, application of adequate soil amendments, proper tillage practice, and management of crop residue.

### *Drainage*

Only about 12 percent of the acreage of Garrett County needs artificial drainage for crops, and less than 7 percent of the acreage consists of soils on which drainage is the most important concern in management.

Soils that require no artificial drainage for farming are those of the Allegheny, Calvin, Clymer, Dekalb, Gilpin, Laidig, Leetonia, Lehew, Meckesville, Pope, and Ungers series, as well as Stony land and Very stony land. Altogether, these make up about 71 percent of the county.

Soils that require artificial drainage for farming are those of the Albrights, Cavode, Cookport, Ernest, Philo, and Wharton series. These soils make up about 19 percent of the county, but they include some soils which normally are not drained because they are too stony for use as cropland.

Soils that require intensive artificial drainage for farming are those of the Andover, Armagh, Atkins, Brinkerton, Nolo, and Purdy series. These soils make up about 6 percent of the county, and some of these are very stony.

Soils that require even more intensive artificial drainage for farming are of the Elkins and Lickdale series. These are less extensive soils, and they are very stony in places.

The remaining acreage of the county, approximately 13 percent, consists of miscellaneous land types that are not suitable for farming, even if they are artificially drained.

The kinds of drainage systems that are suitable for the soils of the county and information on their design and installation are given in the "Drainage Guide for Maryland," which can be obtained from the Maryland Agricultural Extension Service of the Maryland Agricultural Experiment Station.

The Atkins, Elkins, Philo, and Pope soils and Alluvial land are on flood plains. Severity of the flood hazard varies from place to place and cannot be predicted. Records of flooding on individual reaches of streams are the best guides to the need for flood protection.

### *Irrigation*

The amount and distribution of rainfall in Garrett County generally are adequate for crops, but there are extended dry periods when irrigation can be the means of sustaining crop growth. Information concerning irrigation is given in the "Maryland Guide for Sprinkler Irrigation," which can be obtained from the Maryland Extension Service or the Maryland Agricultural Experiment Station. Features that affect the suitability of individual soils for irrigation are given in table 6, "Engineering interpretations," in the section "Use of the Soils in Engineering."

### *Soil amendments*

Most of the soils of Garrett County are naturally low in plant nutrients, and some are very low. All of the soils are acid, and some are extremely acid. For these reasons, additions of fertilizer and lime are needed. The amount of lime and the kind and amount of fertilizer needed can be judged by learning how well crops have responded in the past, by determining the yield level the farmer desires, by studying records of previous manage-

ment, and by having soil tests performed. Assistance in determining the specific requirement for each soil can be obtained at the county office of the Maryland Extension Service, which can arrange to have soils tested at the Soil Testing Laboratory of the University of Maryland.

Lime generally is needed about once every 3 years. Very wet soils that have a high content of organic matter, such as those of the Elkins and Lickdale series, require more frequent or larger applications of lime than most other soils of the county. Different soils in the same field commonly need different amounts of lime. The use of too much lime, particularly on a sandy soil, should be avoided.

Soils that are cultivated annually become deficient in nitrogen, phosphorus, and potassium if these elements are not replenished. Soils also become deficient in such other elements as sulfur, boron, zinc, and copper. Soil tests reveal such deficiencies and indicate the kind, amount, and frequency of fertilizer applications needed. Manure furnishes some of the essential plant nutrients, as well as organic-matter content.

### *Tillage*

Excessive tillage breaks down soil structure, causes loss of organic matter, and increases the hazard of erosion. On all the soils in the county tillage should be limited to that needed for quick germination of seeds, adequate growth of seedlings, and the maturing of a normal crop.

All sloping soils that are susceptible to erosion but suited to cultivation—soils in capability subclasses IIe, IIIe, and IVe—are better tilled on the contour if the topography permits. Stripcropping on the contour is even more effective in checking erosion. Effectiveness is increased when crops are rotated on each of the strips. Generally, steeper areas should have narrower strips and longer rotations than more gently sloping areas. Assistance in planning cropping strips and tillage practices can be obtained from the Garrett Soil Conservation District.

The continued use of heavy machinery to prepare the land and to cultivate crops compacts the soil and makes it difficult to work. Such damage is most severe if the soil is too wet when machinery is used. Most likely to be damaged are poorly drained soils that have a silt loam surface layer. These include most soils of the Andover, Armagh, Atkins, Brinkerton, Cavode, Elkins, Lickdale, Nolo, and Purdy series. Better drained soils, and those that have a sandier surface layer, are less seriously affected.

### *Use of crop residue*

Leaving crop residue on the surface helps protect the soil from water erosion and soil blowing. If the residue is later plowed so that it is kept near to and partly on the surface, it supplies organic matter, improves structure, increases aeration, reduces runoff, and increases the intake of water into the soil.

## Estimated Yields

Table 2 shows the estimated average yields per acre of the crops most commonly grown in Garrett County under improved, or high-level, management. To obtain the yields listed in table 2, all or nearly all of the following practices are needed:

1. Contour tillage, stripcropping, terracing, minimum tillage, and similar practices are used to control erosion on soils that are suitable for cultivation but susceptible to erosion; soils that need drainage are adequately drained; excess water is disposed of safely; and irrigation water is supplied to soils and crops when they need it.
2. Crop rotations are of adequate length. They generally consist of a tilled crop that helps to control weeds, a deep-rooted crop that improves soil aeration and permeability, a legume for 1 year or more to help maintain or improve fertility, and a close-growing crop or a green-manure crop that helps to improve structure and tilth, supplies organic matter, and reduces erosion.
3. Manure, crop residue, and green-manure crops are turned under to supply nitrogen and other plant nutrients. This also improves tilth and helps to control losses from erosion.
4. Fertilizer and lime are applied according to needs indicated by management history, soil tests, and farmer objectives.
5. Suitable methods of plowing, preparing the seedbed, and cultivating are used, but tillage is kept to a minimum.
6. Soil preparation, planting, cultivating, and harvesting are done at the proper time and in the proper way.
7. Weeds, diseases, and insects are controlled without disturbing the soil more than necessary.
8. Crop varieties best suited to the soils are planted at populations recommended to achieve the desired yield goal; some varieties of some crops may require special management for best production.
9. Fertilizers and other chemicals are used only in amounts required to achieve yield and quality goals. This helps to avoid unnecessary secondary effects and offsite damages that may affect other soils, water, air, plants, and animals, including people.

The yields shown in table 2 are not presumed to be the highest yields obtainable, but they set a goal that is practical for most farmers to reach if they use good management. Yields on any soil can be expected to vary because of difference in management, in the weather, in crop varieties grown, and in numbers and kinds of insects and diseases. Under good management, however, yields should not vary more than about 10 percent from those given in table 2.

More information about management practices needed to obtain good yields can be found in the sections, "Capability Grouping" and "General Management Requirements."

TABLE 2.—*Estimated average yields per acre of specified crops under high-level management*

[Absence of a yield figure indicates the crop is not suited to the soil or is not commonly grown on it, or the soil is not arable]

| Soil | Corn | | Oats | Wheat | Hay | | Pasture | |
|---|---|---|---|---|---|---|---|---|
| | Grain | Silage | | | Alfalfa and grass | Tall grass and clover | Bluegrass | Tall grass |
| | *Bu.* | *Tons* | *Bu.* | *Bu.* | *Tons* | *Tons* | *Cow-acre-days*[1] | *Cow-acre-days*[1] |
| Albrights silt loam, 0 to 8 percent slopes | 105 | 21 | 70 | 40 | 3. 5 | 3. 0 | 135 | 200 |
| Albrights silt loam, 8 to 15 percent slopes, moderately eroded | 90 | 18 | 65 | 40 | 3. 5 | 3. 0 | 135 | 200 |
| Albrights very stony silt loam, 0 to 15 percent slopes | | | | | | | 110 | |
| Allegheny fine sandy loam, 0 to 8 percent slopes | 120 | 24 | 75 | 45 | 4. 5 | 3. 5 | 160 | 255 |
| Alluvial land | | | | | | 2. 5 | 115 | 145 |
| Alluvial land, very stony | | | | | | | | |
| Armagh silt loam | 80 | 16 | 60 | | | 2. 5 | 115 | 145 |
| Atkins silt loam | 100 | 20 | 60 | 30 | | 3. 0 | 135 | 170 |
| Brinkerton and Andover silt loams, 0 to 3 percent slopes | 90 | 18 | 60 | | | 2. 5 | 115 | 145 |
| Brinkerton and Andover silt loams, 3 to 8 percent slopes | 90 | 18 | 60 | | | 2. 5 | 115 | 145 |
| Brinkerton and Andover very stony silt loams, 0 to 15 percent slopes | | | | | | | | |
| Calvin-Gilpin-Ungers channery loams, 10 to 20 percent slopes, moderately eroded | 85 | 17 | 60 | 35 | 3. 5 | 3. 0 | 135 | 200 |
| Calvin-Gilpin-Ungers channery loams, 20 to 35 percent slopes, moderately eroded | 80 | 16 | 55 | 30 | 3. 0 | 2. 5 | 115 | 170 |
| Calvin-Gilpin-Ungers channery loams, 20 to 35 percent slopes, severely eroded | | | | | | | 90 | |
| Calvin and Lehew channery loams, 35 to 50 percent slopes | | | | | | | 70 | |
| Calvin, Ungers and Lehew channery loams, 10 to 20 percent slopes, moderately eroded | 75 | 15 | 55 | 35 | 3. 0 | 2. 5 | 115 | 170 |
| Calvin, Ungers and Lehew channery loams, 20 to 35 percent slopes, moderately eroded | 70 | 14 | 50 | 30 | 3. 0 | 2. 0 | 90 | 170 |
| Calvin, Ungers and Lehew channery loams, 20 to 35 percent slopes, severely eroded | | | | | | | 80 | |
| Cavode silt loam, 0 to 8 percent slopes | 85 | 17 | 65 | 35 | | 3. 0 | 135 | 170 |
| Cavode silt loam, 8 to 15 percent slopes, moderately eroded | 80 | 16 | 60 | 30 | | 3. 0 | 135 | 170 |
| Clymer channery loam, 0 to 10 percent slopes | 120 | 24 | 75 | 45 | 4. 5 | 3. 5 | 160 | 255 |
| Cookport channery loam, 0 to 8 percent slopes | 100 | 20 | 65 | 40 | 3. 5 | 3. 0 | 135 | 200 |
| Cookport channery loam, 8 to 15 percent slopes, moderately eroded | 90 | 18 | 60 | 35 | 3. 5 | 3. 0 | 135 | 200 |
| Cookport and Ernest very stony silt loams, 0 to 8 percent slopes | | | | | | | 110 | |
| Cookport and Ernest very stony silt loams, 8 to 25 percent slopes | | | | | | | 100 | |
| Cut and fill land | | | | | | | | |
| Dekalb channery loam, 0 to 10 percent slopes | 80 | 16 | 60 | 35 | 3. 5 | 3. 0 | 135 | 200 |
| Dekalb channery loam, 10 to 20 percent slopes, moderately eroded | 75 | 15 | 55 | 35 | 3. 0 | 2. 5 | 115 | 170 |
| Dekalb channery loam, 20 to 35 percent slopes, moderately eroded | 70 | 14 | 50 | 30 | 3. 0 | 2. 0 | 90 | 170 |
| Dekalb-Calvin-Lehew very stony loams, 0 to 15 percent slopes | | | | | | | 100 | |
| Dekalb-Calvin-Lehew very stony loams, 15 to 25 percent slopes | | | | | | | 70 | |
| Dekalb and Gilpin very stony loams, 0 to 15 percent slopes | | | | | | | 100 | |
| Dekalb and Gilpin very stony loams, 15 to 25 percent slopes | | | | | | | 70 | |
| Dekalb and Leetonia very stony sandy loams, 0 to 15 percent slopes | | | | | | | 70 | |
| Dekalb and Leetonia very stony sandy loams, 15 to 25 percent slopes | | | | | | | 55 | |
| Elkins silt loam | 100 | 20 | 60 | | | 3. 0 | 135 | 170 |
| Ernest silt loam, 0 to 3 percent slopes | 100 | 20 | 65 | 40 | 3. 5 | 3. 0 | 135 | 200 |
| Ernest silt loam, 3 to 8 percent slopes | 100 | 20 | 65 | 40 | 3. 5 | 3. 0 | 135 | 200 |
| Ernest silt loam, 8 to 15 percent slopes, moderately eroded | 90 | 18 | 60 | 35 | 3. 5 | 3. 0 | 135 | 200 |
| Ernest silt loam, 15 to 30 percent slopes, moderately eroded | 80 | 16 | 55 | 35 | 3. 0 | 2. 5 | 115 | 170 |

See footnote at end of table.

TABLE 2.—*Estimated average yields per acre of specified crops under high-level management*—Continued

| Soil | Corn | | Oats | Wheat | Hay | | Pasture | |
|---|---|---|---|---|---|---|---|---|
| | Grain | Silage | | | Alfalfa and grass | Tall grass and clover | Bluegrass | Tall grass |
| | *Bu.* | *Tons* | *Bu.* | *Bu.* | *Tons* | *Tons* | *Cow-acre-days*[1] | *Cow-acre-days*[1] |
| Gilpin channery silt loam, 0 to 10 percent slopes, moderately eroded | 90 | 18 | 65 | 40 | 3. 5 | 3. 0 | 135 | 200 |
| Gilpin channery silt loam, 10 to 20 percent slopes, moderately eroded | 85 | 17 | 60 | 35 | 3. 5 | 3. 0 | 135 | 200 |
| Gilpin channery silt loam, 20 to 35 percent slopes, moderately eroded | 80 | 16 | 55 | 30 | 3. 0 | 2. 5 | 115 | 170 |
| Gilpin channery silt loam, 20 to 35 percent slopes, severely eroded | | | | | | | 95 | |
| Laidig very stony loam, 0 to 8 percent slopes | | | | | | | 110 | |
| Laidig very stony loam, 8 to 25 percent slopes | | | | | | | 100 | |
| Lickdale silt loam | 80 | 16 | 55 | | | 2. 5 | 115 | 145 |
| Lickdale very stony silt loam | | | | | | | | |
| Meckesville silt loam, 0 to 8 percent slopes | 100 | 20 | 70 | 40 | 4. 0 | 3. 0 | 135 | 230 |
| Meckesville silt loam, 8 to 15 percent slopes, moderately eroded | 95 | 19 | 65 | 35 | 4. 0 | 3. 0 | 135 | 230 |
| Meckesville very stony silt loam, 0 to 8 percent slopes | | | | | | | 110 | |
| Meckesville very stony silt loam, 8 to 25 percent slopes | | | | | | | 100 | |
| Nolo silt loam, 0 to 8 percent slopes | 80 | 16 | 60 | | | 2. 5 | 115 | 145 |
| Peat | | | | | | | | |
| Philo silt loam | 130 | 26 | 80 | 45 | 4. 5 | 3. 5 | 160 | 255 |
| Pope silt loam | 135 | 27 | 80 | 50 | 5. 0 | 3. 5 | 160 | 285 |
| Purdy silt loam, 0 to 15 percent slopes, moderately eroded | 80 | 16 | 55 | | | 2. 5 | 115 | 145 |
| Stony land, steep | | | | | | | 50 | |
| Strip mines and dumps | | | | | | | | |
| Swamp | | | | | | | | |
| Ungers, Calvin and Lehew channery loams, 0 to 10 percent slopes | 95 | 19 | 65 | 35 | 4. 0 | 3. 0 | 135 | 210 |
| Ungers-Gilpin-Calvin channery loams, 0 to 10 percent slopes | 105 | 21 | 70 | 40 | 4. 0 | 3. 0 | 135 | 215 |
| Very stony land, rolling | | | | | | | | |
| Very stony land, steep | | | | | | | | |
| Wharton silt loam, 0 to 10 percent slopes, moderately eroded | 90 | 18 | 65 | 40 | 3. 5 | 3. 0 | 135 | 200 |
| Wharton silt loam, 10 to 20 percent slopes, moderately eroded | 80 | 16 | 60 | 35 | 3. 5 | 3. 0 | 135 | 200 |

[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. For example, an acre of pasture that provides 30 days of grazing for two cows has a carrying capacity of 60 cow-acre-days.

## Woodland [2]

According to the Maryland Department of Forests and Parks, about 69 percent of Garrett County had a woodland cover in 1969. Nearly half of the area in farms was farm woodland. Almost all of the woodlands of the county have been cut over, and cutting for timber and especially for pulpwood continues at a moderately high level. Hardwoods are dominant in the county, and oaks are the dominant hardwoods.

Just as soils are placed in capability classes, subclasses, and units according to their suitability for crops and pasture, they are grouped also according to their suitability for woodland use. This classification is based on soil productivity for economic woodland species and on degree and kinds of limitation of soils for woodland use. In this system, soils are grouped at three levels: the class, subclass, and group.

WOODLAND CLASSES, the broadest grouping, are designated by the Arabic numerals 1 through 6. The numerals indicate progressively less productivity for woodland products of species suited to the kind of soil. Class 1 produces the highest yields, and class 6 the lowest yields. Some miscellaneous land types are not included in this system.

WOODLAND SUBCLASSES are soil groups within a class. They are designated by adding a lower case letter to the class numeral, for example 4f. These subclasses are based on soil properties that cause limitations in management.

The letter *x* shows that the soils have restrictions or limitations due to excessive stoniness; *w* shows limitations because of excessive water, either seasonally or year around; *d* shows limitations because of restricted rooting depth; *c* shows restrictions or limitations because of the kind and amount of clay in the profile; *f* shows limita-

[2] Prepared with the assistance of ROSS H. MELLINGER, woodland conservationist, Soil Conservation Service, Morgantown, West Virginia.

tions because of the amount of fragments between 2 millimeters and stone size (10 inches) in the profile; *r* shows limitations because of slope; and *o* shows that there are no significant restrictions or limitations for woodland use or management.

If soils have more than one kind of limitation or restriction, they are given the first applicable subclass designation in the above list, which is one of priority. For example, an extremely stony soil is placed in subclass *x*, even though it may be excessively wet (w), or clayey (c), or sloping (r). According to this system, a soil can be placed in subclass *r* only if it has no limitation other than slope.

WOODLAND GROUPS are soil groups within the subclasses. They are designated by a number, the last part of the symbol. The soils in one group are enough alike not only to have the same level of productivity (class) and the same kind of limitation, if any (subclass), but also to have about the same *degree* of limitation, to be suited to the same kind of trees, and to require about the same kind of management for wood crop production. Thus, soils of the same class and subclass that are suited to different kinds of trees are placed in separate woodland groups; soils that have different degrees of limitations are placed in separate groups; and soils that have different combinations of limitations are placed in separate groups.

Productivity for forest trees is measured by site index (table 3). The site index is the average height, in feet, of the dominant and codominant trees in the stand at 50 years of age. For example, if the site index for yellow-poplar is 82 on a given soil this means that the dominant and codominant trees in a stand of yellow-poplar on that soil have an average height of 82 feet when the trees are 50 years old.

On the basis of ratings for yellow-poplar, soils in woodland group 1 have a site index of more than 95; class 2 soils have a site index between 85 and 95; class 3 soils have a site index between 75 and 85; class 4 soils have a site index between 65 and 75; class 5 soils have a site index between 55 and 65; and class 6 soils have a site index of less than 55.

On the basis of ratings for oak, Virginia pine, and black cherry, class 1 soils have a site index of more than 85; class 2 soils have a site index between 75 and 85; class 3 soils have a site index between 65 and 75; class 4 soils have a site index between 55 and 65; class 5 soils have a site index between 45 and 55; and class 6 soils have a site index of less than 45.

Certain terms are used in the following discussions of woodland groups and are defined as follows:

Plant competition is the invasion or growth of undesirable plants when openings are made in the canopy. In Garrett County, plant competition generally is more severe for pine than for hardwoods. A rating of slight means that competition does not prevent adequate natural regeneration of desirable species; moderate means that competition delays but does not prevent natural or artificial regeneration; and severe means that competition prevents such regeneration unless intensive site preparation and maintenance treatments, such as weeding, are undertaken.

Equipment restriction refers to trafficability of the soil. The ratings given indicate the degree to which the soil and its topographic features restrict or prohibit the use of equipment commonly used in tree harvesting or cultural work.

TABLE 3.—*Relationship of site index and actual age to yields of natural, even-aged, fully stocked stands of selected trees*

[Dashed lines mean that data are not available or that the species is not suitable]

| Site index | Age | Upland oaks | | Yellow-poplar | | Virginia pine |
|---|---|---|---|---|---|---|
| | *Years* | *Bd. ft.* | *Cords* | *Bd. ft.* | *Cords* | *Cords* |
| 50 | 30 | 300 | 6 | --- | --- | 13 |
| | 50 | 2,900 | 19 | --- | --- | 19 |
| | 70 | 7,400 | 30 | --- | --- | --- |
| 60 | 30 | 800 | 10 | 900 | 8 | 19 |
| | 50 | 5,700 | 26 | 5,100 | 21 | 31 |
| | 70 | 11,600 | 39 | --- | --- | --- |
| 70 | 30 | 1,600 | 15 | 2,400 | 15 | 33 |
| | 50 | 8,800 | 33 | 10,300 | 31 | 57 |
| | 70 | 16,000 | 47 | --- | --- | --- |
| 80 | 30 | 3,000 | 20 | 4,900 | 21 | 57 |
| | 50 | 12,400 | 41 | 16,000 | 41 | 93 |
| | 70 | 21,000 | 56 | --- | --- | --- |
| 90 | 30 | 4,600 | 24 | 7,800 | 27 | --- |
| | 50 | 16,000 | 48 | 22,100 | 52 | --- |
| | 70 | 26,200 | 65 | --- | --- | --- |
| 100 | 30 | --- | --- | 11,000 | 32 | --- |
| | 50 | --- | --- | 29,100 | 62 | --- |
| | 70 | --- | --- | --- | --- | --- |

Seedling mortality refers to the expected degree of failure for natural seedlings or planting stock as influenced by kind of soil, degree of erosion, or other site factors. A rating of slight means that expected mortality is less than 25 percent; moderate means that expected mortality is between 25 and 50 percent; and severe means that expected mortality is more than 50 percent.

Erosion hazard refers to the potential soil erosion that may take place following cutting operations and where the soil is exposed along roads, skid trails, fire lanes, and log decking areas.

Windthrow hazard is an evaluation of soil characteristics that control root development and therefore affect firmness of trees against winds. A rating of slight means that no special problems are recognized; moderate means that root development is adequate for stability except during periods of excessive soil wetness or periods of strong wind velocity; and severe means that depth of tree roots does not give adequate stability and that individual trees are more or less easily blown over during periods of higher than average wind velocity.

Aspect refers to the direction in which a slope faces. A slope facing the sun has what is known as a south aspect and obtains more direct energy than one facing away from the sun. On south aspects there is greater evaporation of moisture than on north aspects, and there is less moisture for tree growth. Actual measurements prove that trees grow more slowly on south aspects than on north aspects of exactly the same kind of soil, and that yields of woodland products are lower.

The effects of aspect on tree growth are of little practical significance except on stronger slopes, and the effects are greater on relatively thin soils that do not have a high capacity for retaining moisture. Thus in Garrett County, aspect is considered to be significant only on certain soils that slope more than about 15 percent.

North aspects are defined as those which face in any compass direction more northerly than northwest or more northerly than southeast. South aspects are defined as those more southerly than northwest or more southerly than southeast.

In the following pages, the woodland groups of Garrett County are described and their limitations are given along with suggestions for their use and management. Many site indexes given for the groups are based on actual measurements in Garrett County and nearby areas. Other site indexes, particularly some of those given for less extensive soils, are based on estimates by experienced woodland conservationists and soil specialists.

The soil series represented in each group are named, but this does not mean that all the soils of the series are in the unit. To find the group in which a given soil has been placed, refer to the "Guide to Mapping Units" at the back of this survey.

#### WOODLAND GROUP 1w1

The only soil in this group is Philo silt loam. This soil is moderately well drained and nearly level. It is subject to flooding, but flooding is seldom severe enough to affect woodland production or management adversely.

Placement of this soil in woodland class 1 is based on its excellent productivity for yellow-poplar and oaks. The site index is more than 95 for yellow-poplar and more than 85 for oaks. Yellow-poplar, black walnut, white pine, ash, black cherry, or sugar maple should be favored in existing stands. Species suitable for planting are white pine and yellow-poplar.

Plant competition is severe for conifers and moderate to severe for hardwoods. Seedling mortality is slight. Equipment restrictions are moderate because of seasonal wetness and the hazard of flooding. Windthrow and erosion are no more than slight hazards.

#### WOODLAND GROUP 1w2

This group consists of soils of the Armagh, Atkins, Elkins, Lickdale, and Purdy series. These soils are poorly drained to very poorly drained, and some of them are very stony. The Atkins and Elkins soils are subject to flooding.

Placements of these soils in woodland group 1 is based on their excellent productivity for pin oak, and the site index is estimated to be more than 85. Red maple or sycamore should be favored in existing stands. Species suitable for planting are white pine, white spruce, and Norway spruce.

Plant competition and seedling mortality are severe. Equipment restrictions are severe because of seasonal wetness and a high water table, and because of the hazard of flooding on some of the soils. Windthrow hazard is slight, ranging toward moderate. There is little or no hazard of erosion.

#### WOODLAND GROUP 2w1

This group consists of soils of the Cavode, Cookport, Ernest, and Wharton series. These are moderately deep to deep, moderately well drained and somewhat poorly drained soils that slope as much as about 25 percent.

Placement of these soils in woodland group 2 is based on their very good productivity for upland oaks and black cherry. The site index is between 75 and 85 for oaks, but is somewhat higher for black cherry. Red oak, black cherry, yellow-poplar, ash, or sugar maple should be favored in existing stands. Species available for planting are yellow-poplar, white pine, black cherry, Japanese larch, and Norway spruce.

Plant competition is moderate for hardwoods and severe for conifers. Seedling mortality is slight. Equipment limitations are moderate because the water table is fairly close to the soil surface late in winter and early in spring. The hazards of erosion and of windthrow are slight. On slopes of more than about 15 percent the hazard of erosion is moderate.

#### WOODLAND GROUP 2w2

This group consists of soils of the Brinkerton and Andover series. These soils are poorly drained. Slopes range to about 15 percent.

Placement of these soils in woodland group 2 is based on their very good productivity for upland oaks and black cherry. The site index for each species is between 75 and 85. Ash, red oak, and black cherry should be favored in existing stands. White pine is suggested as probably the most suitable species for planting, although black cherry and Norway spruce are also suitable.

Plant competition is severe for both hardwoods and conifers. Seedling mortality is severe in places because of wetness and frost heaving. Equipment limitations are severe because of long periods of wetness when the water table is at or near the soil surface. Erosion is little or no hazard, and the hazard of windthrow is slight to moderate.

#### WOODLAND GROUP 2w3

This group consists of Alluvial land and Alluvial land, very stony. These land types generally are poorly drained and are subject to periodic flooding. They are nearly level to gently sloping.

Placement of these land types in woodland group 2 is based on their very good productivity for oaks and black cherry. The site index for each species is between 75 and 85. Ash, red oak, pin oak, and black cherry should be favored in existing stands. Species suitable for planting are white pine and Norway spruce.

Plant competition is severe for both hardwoods and conifers. Seedling mortality is severe in places because of wetness, frost heaving, and the hazard of flooding. Equipment limitations are severe because of long periods of wetness and the flood hazard in spring. The hazard of erosion is slight, but areas of Alluvial land are subject to scouring during flood periods. There is little or no hazard of windthrow.

#### WOODLAND GROUP 2f1

This group consists of north aspects only of soils of the Calvin, Gilpin, Ungers, Lehew, and Dekalb series and of areas of Stony land. Soils of this group are mod-

erately deep over bedrock and are well drained. Slopes range from about 15 to 35 percent, but some slopes are nearly 100 percent in Stony land, steep.

Placement of these soils in woodland group 2 is based on their very good productivity for upland oak, the site index for which is between 75 and 85. The soils are also very productive for yellow-poplar and black cherry. In addition to these species, white pine, ash, or sugar maple should be favored in existing stands. Species suitable for planting are white pine, Virginia pine, Norway spruce, red pine, and Japanese larch. Planting of red pine generally is restricted to elevations above 2,000 feet.

Plant competition is moderate for hardwoods and severe for conifers. Equipment restrictions range from moderate to severe on slopes of more than 35 percent. Seedling mortality and the hazard of windthrow are slight. The hazard of erosion ranges from slight to moderate on the steeper soils.

#### WOODLAND GROUP 2r1

This group consists of soils of the Laidig and Meckesville series and north aspects of some of the soils of the Gilpin series. These soils are moderately deep to deep and well drained. Slopes are generally between about 8 and 35 percent.

Placement of these soils in woodland group 2 is based on their very good productivity for yellow-poplar and upland oaks. The site index is between 85 and 95 for yellow-poplar and between 75 and 85 for oak. Yellow-poplar, white oak, red oak, black walnut, black cherry, or sugar maple should be favored in existing stands. Species suitable for planting are white pine, black walnut, Norway spruce, Japanese larch, and yellow-poplar. Planting of red pine generally is restricted to elevations above 2,000 feet.

Plant competition is moderate for hardwoods and severe for pines and other conifers. Restrictions on the use of heavy equipment are moderate because of slope. Seedling mortality and the hazard of windthrow are slight. The hazard of erosion is moderate because of slope, ranging to slight on the more gently sloping Meckesville soil.

#### WOODLAND GROUP 2o1

This group consists of nearly level to strongly sloping soils of the Allegheny, Clymer, Gilpin, Laidig, Meckesville, Pope, Ungers, and Calvin series. These are moderately deep to deep, well-drained soils on uplands, foot slopes, and terraces.

Placement of these soils in woodland group 2 is based on their good productivity for upland oaks and yellow-upland oaks. The site index is between 85 and 95 for yellow-poplar and between 75 and 85 for oak. Yellow-poplar, white oak, red oak, black walnut, black cherry, or sugar maple should be favored in existing stands. Species suitable for planting are white pine, Norway spruce, Japanese larch, yellow-poplar, black locust, black walnut, and, in places, Virginia pine. Red pine is suited to planting at elevations above 2,000 feet.

Plant competition for hardwoods is moderate, but it is severe for conifers. Limitations on the use of equipment, seedling mortality, and the hazards of windthrow and erosion are slight.

#### WOODLAND GROUP 3w1

This group consists of soils of the Albrights series. These soils are somewhat poorly drained to moderately well drained. Slopes are as much as 15 percent.

Placement of these soils in woodland group 3 is based on their good productivity for upland oaks and yellow-poplar. The site index is between 65 and 75 for oak and between 70 and 80 for yellow-poplar. Ash, black cherry, sugar maple, red oak, white oak, and white pine should be favored in existing stands. Species suitable for planting are yellow-poplar, white pine, Norway spruce, Japanese larch, and black cherry. Red pine is suited to elevations above about 2,000 feet.

Plant competition is slight to moderate for hardwoods and moderate to severe for conifers. Seedling mortality is slight. Equipment restrictions are moderate because of wetness and a high water table late in winter and early in spring. The hazards of erosion and windthrow are slight.

#### WOODLAND GROUP 3w2

This group consists of poorly drained soils of the Nolo series. Slopes range to about 8 percent.

Placement of these soils in woodland group 3 is based on their good productivity for upland oaks and black cherry. The site index for each species is between 65 and 75. Ash, red oak, and black cherry should be favored in existing stands. White pine is the best species for planting, although black cherry and Norway spruce are also suitable.

Plant competition is severe for both hardwoods and conifers. Seedling mortality is severe in places because of wetness and frost heaving. Equipment limitations are severe because of long periods of wetness and because the water table is near the soil surface. The hazard of windthrow is moderate because of long periods of wetness and soft soil, and because the rooting depth is moderately restricted for many trees. There is little or no hazard of erosion.

#### WOODLAND GROUP 3f1

This group consists of Stony land, steep, and soils of the Calvin, Dekalb, Gilpin, Lehew, and Ungers series. The soils are mostly moderately deep and well drained, although the Ungers soils are deeper. On neutral aspects slopes are as much as 20 percent. On south aspects slopes generally are more than 20 percent. Some south aspects consist of Stony land, steep, which has slopes of as much as 100 percent. Calvin and Lehew soils on north aspects are more droughty than the other soils of this group.

Placement of these soils in woodland group 3 is based on their good productivity for upland oaks, the site index for which is between 65 and 75. These soils also have good productivity for black cherry and yellow-poplar. In addition to these trees, white pine and ash should be favored in existing stands. Species suitable for planting are white pine, Virginia pine, Japanese larch, and Norway spruce. Red pine is also suitable for planting at elevations above 2,000 feet.

Plant competition is slight for hardwoods and moderate for conifers. Seedling mortality is slight. Equipment restrictions are slight to moderate where slopes are more than 15 percent and severe where slopes are more than 35 percent. Windthrow and erosion generally are slight hazards, but erosion is a moderate hazard on the steeper soils.

#### WOODLAND GROUP 3r1

This group consists of south aspects of some of the soils of the Gilpin series. These soils are moderately deep, are well drained, and have slopes that range from 20 to 35 percent.

Placement of these soils in woodland group 3 is based on their good productivity for upland oaks, the site index for which is between 65 and 75. Productivity is better for yellow-poplar. Ash, sugar maple, red oak, white oak, black cherry, white pine, and Virginia pine should be favored in existing stands. Species suitable for planting are white pine, yellow-poplar, Japanese larch, Virginia pine, shortleaf pine, and Norway spruce. Red pine is suitable for planting at elevations above 2,000 feet.

Plant competition is slight for hardwoods and moderate for conifers. Restrictions on the use of heavy equipment are moderate because of slope. Seedling mortality and the hazard of windthrow are slight. The hazard of erosion is moderate on these soils.

#### WOODLAND GROUP 4x1

This group consists of north aspects of Very stony land, steep. The slopes range from about 25 percent to more than 100 percent in places. This land is so stony that both productivity and management are adversely affected.

Placement of this soil in woodland group 4 is based on its fair productivity for upland oak and Virginia pine. The site index for each species is between 55 and 65. Any economic species should be favored in existing stands. Planting is extremely difficult in most places. Species suitable for planting are white pine, pitch pine, and Virginia pine.

Plant competition is slight for hardwoods and moderate for conifers. Seedling mortality is moderate. Equipment restrictions are severe because of extreme stoniness and roughness, and also because of the very steep slope in most areas. Windthrow and erosion are slight hazards.

#### WOODLAND GROUP 4f1

This group consists of nearly level to strongly sloping, very stony sandy loams of the Dekalb and Leetonia series that slope no more than about 25 percent. It also includes south aspects of steep, loamy soils of the Calvin and Lehew series that tend to be somewhat droughty and that slope from 35 to about 50 percent. These soils are moderately deep and well drained. They do not retain moisture well.

TABLE 4.—*Suitability of the soils for elements*

| Soils and map symbols | Elements of wildlife habitat | | | |
|---|---|---|---|---|
| | Grain and seed crops | Grasses and legumes | Wild herbaceous upland plants | Hardwood woody plants |
| Albrights silt loam: AbB, AbC2 | Suited | Well suited | Well suited | Well suited |
| Albrights very stony silt loam: AgC | Not suited | Poorly suited | Well suited | Well suited |
| Allegheny fine sandy loam: AhB | Suited | Well suited | Well suited | Well suited |
| Alluvial land: | | | | |
| An | Suited | Well suited | Well suited | Well suited |
| Ao | Not suited | Poorly suited | Suited | Suited |
| Armagh silt loam: Ar | Poorly suited | Poorly suited | Suited | Suited |
| Atkins silt loam: At | Suited | Well suited | Well suited | Well suited |
| Brinkerton and Andover silt loams: | | | | |
| BrA | Poorly suited | Poorly suited | Suited | Suited |
| BrB | Poorly suited | Poorly suited | Suited | Suited |
| Brinkerton and Andover very stony silt loams: BsC | Not suited | Poorly suited | Suited | Suited |
| Calvin-Gilpin-Ungers channery loams: | | | | |
| CaC2 | Suited | Suited | Suited | Suited |
| CaD2 | Poorly suited | Suited | Suited | Suited |
| CaD3 | Not suited | Poorly suited | Suited | Suited |
| Calvin and Lehew channery loams: CIE | Not suited | Not suited | Suited | Suited |
| Calvin, Ungers and Lehew channery loams: | | | | |
| CnC2 | Suited | Suited | Suited | Suited |
| CnD2 | Poorly suited | Suited | Suited | Suited |
| CnD3 | Not suited | Poorly suited | Suited | Suited |
| Cavode silt loam: | | | | |
| CoB | Suited | Suited | Well suited | Well suited |
| CoC2 | Suited | Suited | Well suited | Well suited |
| Clymer channery loam: CrB | Suited | Well suited | Well suited | Well suited |

Placement of these soils in woodland group 4 is based on their fair productivity for upland oak and Virginia pine. The site index for each species is between 55 and 65. Locally on the best sites, the site index is about 70. White pine, pitch pine, Virginia pine, red oak, black oak, and white oak should be favored in existing stands. Species suitable for planting are white pine, Virginia pine, and Japanese larch. Red pine is suitable for planting at elevations above 2,000 feet.

Plant competition is slight for all species. Seedling mortality ranges from slight to moderate and is more severe on south aspects during very dry seasons. The hazard of windthrow and of erosion is slight. Equipment restrictions range from slight on soils sloping less than 15 percent to moderate on soils sloping more than 15 percent.

#### WOODLAND GROUP 5x1

This group consists of all aspects of Very stony land, rolling, and south aspects of Very stony land, steep.

Placement of these soils in woodland group 5 is based on their poor productivity for upland oaks and Virginia pine. The site index for each species is between 45 and 55. Any economic species, especially pine, should be favored in existing stands. If harvesting is not contemplated, all existing species should remain undisturbed. Planting is not generally feasible or practicable. If any planting is done, suitable species are pitch pine, Virginia pine, and white pine.

There is only slight plant competition for any species. Seedling mortality is severe. Equipment restrictions are severe because of extreme stoniness and roughness, and also because of steep slopes in many areas. The hazards of windthrow and erosion are slight.

## Wildlife [3]

Soils and their properties directly affect wildlife habitat, whether the habitat is natural or is established and maintained by man. They are, therefore, of interest to biologists, land use planners, and others concerned with soil, water, plant, and wildlife resources. This part of the soil survey of Garrett County contains information on how soils and their characteristics relate to some important elements of habitat for native wildlife. The method of

[3] Prepared with the assistance of PHILIP F. ALLAN, biologist, Soil Conservation Service, Upper Darby, Pennsylvania.

*of wildlife habitat and kinds of wildlife*

| Elements of wildlife habitat—Continued | | | | Kinds of wildlife | | |
|---|---|---|---|---|---|---|
| Coniferous woody plants | Wetland food and cover plants | Shallow water developments | Excavated ponds | Openland | Woodland | Wetland |
| Poorly suited | Not suited | Not suited | Not suited | Good | Good | Not suited. |
| Poorly suited | Not suited | Not suited | Not suited | Poor | Fair | Not suited. |
| Poorly suited | Not suited | Not suited | Not suited | Good | Good | Not suited. |
| Poorly suited | Suited | Suited | Suited | Good | Fair | Fair. |
| Poorly suited | Poorly suited | Not suited | Not suited | Poor | Fair | Not suited. |
| Suited | Well suited | Suited | Not suited | Poor | Fair | Fair. |
| Poorly suited | Suited | Suited | Suited | Good | Fair | Fair. |
| Suited | Well suited | Well suited | Well suited | Poor | Fair | Good. |
| Suited | Poorly suited | Not suited | Not suited | Poor | Fair | Not suited. |
| Suited | Poorly suited | Not suited | Not suited | Poor | Fair | Not suited |
| Suited | Not suited | Not suited | Not suited | Fair | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Fair | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Poor | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Poor | Poor | Not suited. |
| Suited | Not suited | Not suited | Not suited | Fair | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Fair | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Poor | Fair | Not suited. |
| Poorly suited | Poorly suited | Poorly suited | Poorly suited | Fair | Good | Poor. |
| Poorly suited | Not suited | Not suited | Not suited | Fair | Good | Not suited. |
| Poorly suited | Not suited | Not suited | Not suited | Good | Good | Not suited. |

TABLE 4.—*Suitability of the soils for elements*

| Soils and map symbols | Elements of wildlife habitat | | | |
|---|---|---|---|---|
| | Grain and seed crops | Grasses and legumes | Wild herbaceous upland plants | Hardwood woody plants |
| Cookport channery loam: CtB, CtC2 | Suited | Well suited | Well suited | Well suited |
| Cookport and Ernest very stony silt loams: CuB, CuD | Not suited | Poorly suited | Well suited | Well suited |
| Cut and fill land: Cv. Properties variable. Onsite inspection required. | | | | |
| Dekalb channery loam: | | | | |
| DbB, DbC2 | Suited | Suited | Suited | Suited |
| DbD2 | Poorly suited | Suited | Suited | Suited |
| Dekalb-Calvin-Lehew very stony loams: DcC, DcD | Not suited | Poorly suited | Suited | Suited |
| Dekalb and Gilpin very stony loams: DgC, DgD | Not suited | Poorly suited | Suited | Suited |
| Dekalb and Leetonia very stony sandy loams: DlC, DlD | Not suited | Poorly suited | Suited | Suited |
| Elkins silt loam: Ek | Poorly suited | Suited | Suited | Well suited |
| Ernest silt loam: | | | | |
| ErA | Suited | Well suited | Well suited | Well suited |
| ErB, ErC2 | Suited | Well suited | Well suited | Well suited |
| ErD2 | Poorly suited | Suited | Well suited | Well suited |
| Gilpin channery silt loam: | | | | |
| GnB2, GnC2 | Suited | Suited | Suited | Suited |
| GnD2 | Poorly suited | Suited | Suited | Suited |
| GnD3 | Not suited | Poorly suited | Suited | Suited |
| Laidig very stony loam: LaB, LaD | Not suited | Poorly suited | Well suited | Well suited |
| Lickdale silt loam: Lc, Ls | Not suited | Poorly suited | Well suited | Well suited |
| Meckesville silt loam: McB, McC2 | Suited | Well suited | Well suited | Well suited |
| Meckesville very stony silt loam: MdB, MdD | Not suited | Poorly suited | Well suited | Well suited |
| Nolo silt loam: NoB | Poorly suited | Poorly suited | Suited | Suited |
| Peat: Pe | Not suited | Not suited | Not suited | Not suited |
| Philo silt loam: Ph | Suited | Well suited | Well suited | Well suited |
| Pope silt loam: Ps | Suited | Well suited | Well suited | Well suited |
| Purdy silt loam: PuC2 | Poorly suited | Poorly suited | Suited | Suited |
| Stony land: SrF | Not suited | Not suited | Poorly suited | Poorly suited |
| Strip mines and dumps: St. Properties variable. Onsite inspection required. | | | | |
| Swamp: Sw | Not suited | Poorly suited | Not suited | Suited |
| Ungers, Calvin and Lehew channery loams: UcB | Suited | Suited | Suited | Suited |
| Ungers-Gilpin-Calvin channery loams: UnB | Suited | Suited | Suited | Suited |
| Very stony land: VsD, VsF | Not suited | Not suited | Poorly suited | Poorly suited |
| Wharton silt loam: WhB2, WhC2 | Suited | Well suited | Well suited | Well suited |

*of wildlife habitat and kinds of wildlife* Continued

| Elements of wildlife habitat—Continued | | | | Kinds of wildlife | | |
|---|---|---|---|---|---|---|
| Coniferous woody plants | Wetland food and cover plants | Shallow water developments | Excavated ponds | Openland | Woodland | Wetland |
| Poorly suited | Not suited | Not suited | Not suited | Good | Good | Not suited. |
| Poorly suited | Not suited | Not suited | Not suited | Poor | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Fair | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Fair | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Poor | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Poor | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Poor | Fair | Not suited. |
| Suited | Suited | Suited | Suited | Fair | Good | Fair. |
| Poorly suited | Poorly suited | Poorly suited | Poorly suited | Good | Good | Poor. |
| Poorly suited | Not suited | Not suited | Not suited | Good | Good | Not suited. |
| Poorly suited | Not suited | Not suited | Not suited | Fair | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Fair | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Fair | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Poor | Fair | Not suited. |
| Poorly suited | Not suited | Not suited | Not suited | Poor | Fair | Not suited. |
| Well suited | Well suited | Well suited | Well suited | Poor | Good | Good. |
| Poorly suited | Not suited | Not suited | Not suited | Good | Good | Not suited. |
| Poorly suited | Not suited | Not suited | Not suited | Poor | Fair | Not suited. |
| Suited | Suited | Poorly suited | Poorly suited | Poor | Fair | Poor. |
| Not suited | Well suited | Well suited | Well suited | Not suited | Not suited | Good. |
| Poorly suited | Poorly suited | Poorly suited | Poorly suited | Good | Good | Poor. |
| Poorly suited | Not suited | Not suited | Not suited | Good | Good | Not suited. |
| Suited | Poorly suited | Not suited | Not suited | Poor | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Not suited | Poor | Not suited. |
| Not suited | Well suited | Well suited | Suited | Not suited | Poor | Good. |
| Suited | Not suited | Not suited | Not suited | Fair | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Fair | Fair | Not suited. |
| Suited | Not suited | Not suited | Not suited | Not suited | Poor | Not suited. |
| Poorly suited | Not suited | Not suited | Not suited | Good | Good | Not suited. |

rating the soils is described and the uses of the information along with its limitations are discussed. The soil-habitat relationships are shown in table 4, along with notations of broad relationships with openland, woodland, and wetland wildlife.

The kinds and abundance of most wildlife species depend largely on occurrence and adequate distribution of food, water, and shelter. Different kinds of habitat elements are required to serve these needs. The absence of one or more of the necessary elements, even for relatively short periods, can result in scarcity or absence of some particular kind of wildlife.

Habitat needs of wildlife are provided by different kinds of plants and by available water. Soils influence suitability, growth, and productivity of plants and also affect quality and distribution of water. Plant management for wildlife is achieved by planting or by inducing or improving natural establishment. Water management involves creating or improving water supplies.

The soil-wildlife interpretations that follow are based upon the soil map of the county. They are only general guides, and for detailed planning and application should be supplemented by onsite examination. No attempt is made to relate individual kinds of wildlife to the soils. Present land use, existing vegetation, the relationships of one soil to another, and the mobility of wildlife are not considered.

Some important habitat elements, such as impounded ponds, are not considered. They cannot be appraised from the soil map. Information on soil characteristics related to pond construction is given in another part of this survey.

The habitat needs of wildlife species must be understood if soil interpretations are to be effectively made and used. The information given in this survey is applicable in—

1. Planning broad-scale land use for wildlife, wildlife refuges, parks, nature study areas, and recreational developments.
2. Selecting suitable soil areas for creating, improving, or maintaining the various elements of wildlife habitat.
3. Determining the relative degree of management intensity required to attain satisfactory results.
4. Eliminating sites that are difficult or infeasible to develop for specific kinds of habitat.
5. Determining soil areas desirable for habitat preservation and wildlife use.

Soils are rated for their suitability for the creation, improvement, or maintenance of eight different habitat elements, and for their potential for three classes of wildlife. A rating of good or well suited indicates that the soils have no limitations for the particular habitat element or class of wildlife, and a rating of not suited indicates a limitation so severe that habitat development is not feasible or that the particular class of wildlife is not suitable. The eight habitat elements are defined and described in the following paragraphs.

*Grain and seed crops.*—These are planted seed-producing annuals, such as corn, wheat, barley, oats, buckwheat, sunflower, sorghum, millet, cowpea, and soybeans. Good soils for these plants are deep, nearly level, well drained, and free or nearly free of stones (fig. 8). They have high moisture-supplying capacity, are not frequently flooded, and can be planted to the same or similar crops each year. Other soils have one or more limitations that may vary in severity.

*Grasses and legumes.*—These are planted species valuable for food and cover, such as lespedeza, alfalfa, various clovers, tall fescue, bromegrass, bluegrass, and timothy. Good soils are moderately deep to deep, have good moisture-supplying capacity, and are not more than moderately eroded. Other soils have one or more limitations, variable in severity.

*Wild herbaceous upland plants.*—These include panicgrass and other native grasses, partridgepea, beggarstick, and other native herbs. These plants are better suited to deep upland soils.

*Hardwood woody plants.*—Some hardwood trees and shrubs are valuable for wildlife because they grow vigorously and produce good crops of seeds if they are planted or if they grow naturally. These include persimmon, dogwood, sumac, sassafras, hazelnut, multiflora rose, autumn-olive, wild cherry, various oaks and hickories, huckleberry, walnut, highbush cranberry, blackhaw, and various hollies. These plants are better suited to deep soils.

*Coniferous woody plants.*—These are cone-bearing trees and shrubs, mostly evergreens. They are important for shelter but also provide browse and seeds. Those valuable for wildlife are white pine, Virginia pine, pitch pine, red pine, Austrian pine, northern white-cedar, hemlock, redcedar, Norway spruce, white spruce, shortleaf pine, and juniper. Soils that are shallow and dry cause these plants to grow slowly; this delays closure of the canopy and provides better conditions for wildlife. On soils rated poor, these trees grow too thinly or too rapidly or are easily overtopped by competing hardwoods. Good habitat management includes topping of fast-growing conifers.

*Wetland food and cover plants.*—Examples that provide food and cover for waterfowl and some fur-bearing animals are smartweed, barnyardgrass, bulrush, pondweed, duck-millet, arrow-arum, pickerelweed, waterwillow, cattail, and various sedges. These plants are better suited to soils that have a high water table most of the year.

*Shallow water developments.*—Good soils for shallow impoundments have a high water table much of the year and are in positions where the water level can be readily controlled and maintained within 2 feet above the soil surface.

*Excavated ponds.*—The suitability of a soil for an excavated pond depends on how well the pond can be supplied by ground water. These ponds must not depend upon runoff from surrounding areas, although runoff water may help keep the pond at the desired level.

Table 4 also shows suitability of the soils for major classes of wildlife: openland wildlife, woodland wildlife, and wetland wildlife. The ratings are based on the ratings given in the table for the various habitat elements. Ratings for openland wildlife are based on ratings for grain and seed crops, grasses and legumes, and wild herbaceous upland plants. Ratings for woodland wildlife are based on ratings for hardwood woody plants, conif-

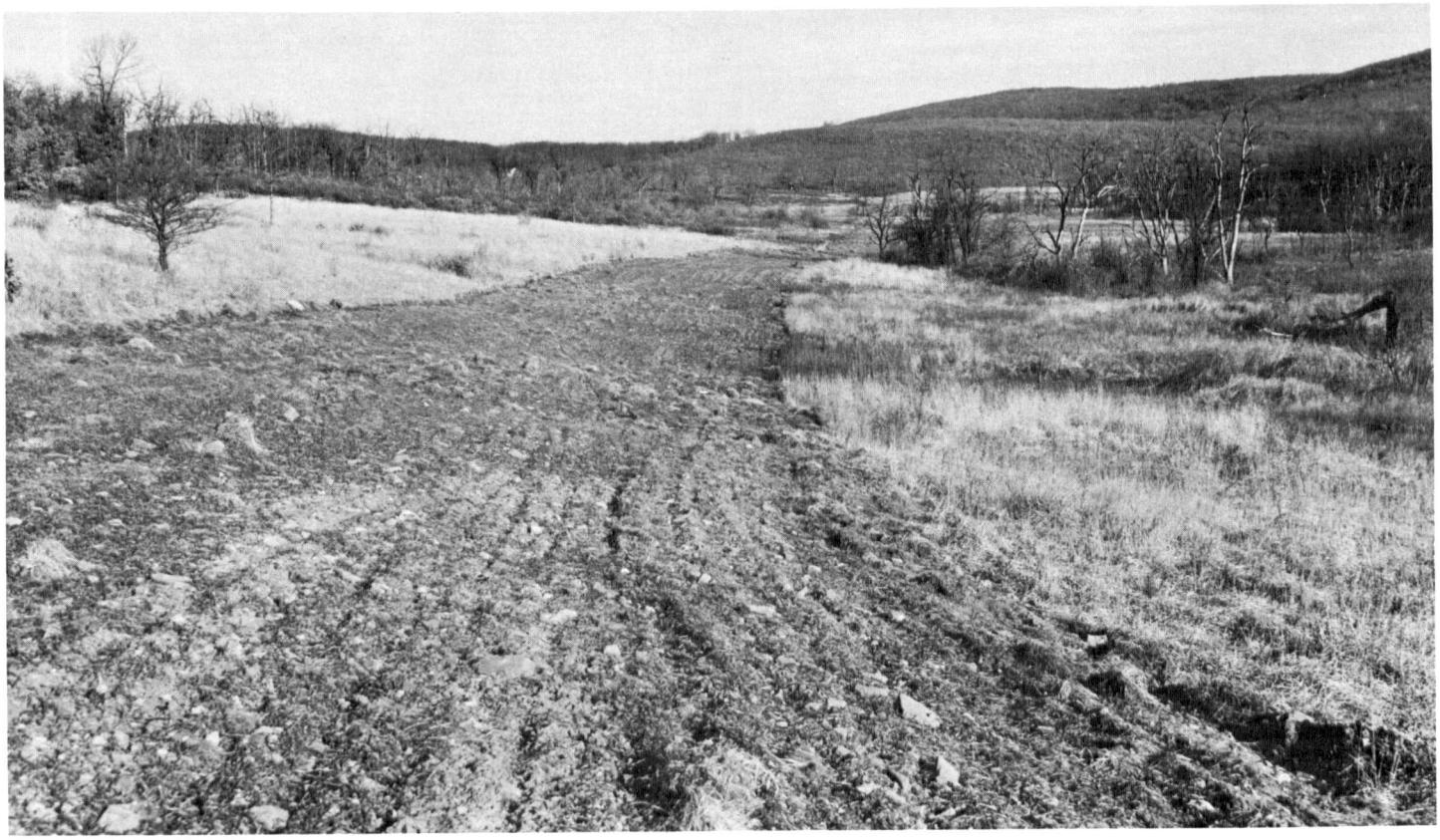

*Figure 8.*—**A strip prepared for planting wheat and other food crops for wildlife, near Deer Park. The soil is Gilpin channery silt loam.**

erous woody plants, wild herbaceous upland plants, and grasses and legumes. Ratings for wetland wildlife are based on ratings for wetland food and cover plants and shallow water developments or excavated ponds.

The three major classes of wildlife in Garrett County are defined as follows:

Openland wildlife refers to birds and animals that normally are found in such open situations as crop fields, meadows, pastures, and nonforested, overgrown lands. Included are quail, doves, rabbits, meadow larks, killdeer, pheasants, field sparrows, and songbirds.

Woodland wildlife refers to birds and animals that normally are found in a wooded habitat. Included are grouse, wild turkeys, deer, squirrels, raccoons, woodpeckers, and songbirds.

Wetland wildlife refers to birds and animals that normally find habitat in wet situations, such as ponds, marshes, and swamps. Examples are ducks, geese, herons, snipe, and muskrat. Raccoons appear to be nearly as well adapted to wetland as to woodland and, if they have a choice, appear to prefer very wet woodlands. Beavers find habitat along waterways, where their dams tend to make adjacent wetlands even wetter.

About 9 percent of the county area is rated good for potential habitat for openland wildlife, and another 22 percent is rated fair. Therefore, 31 percent of the county has a reasonable potential for producing habitat suited to birds and animals normally found in open situations.

About 10 percent of the county area is rated good for potential habitat for woodland wildlife, and another 70 percent is rated fair. Therefore, 80 percent of the county has a reasonable potential for producing habitat suited to birds and animals normally found in woodland situations.

Only about 2.5 percent of the county area is rated good for potential habitat for wetland wildlife, and another 2 percent is rated fair. Therefore, only 4.5 percent of the county has a reasonable potential for producing habitat suited to birds and animals normally found in wetland situations.

## Use of the Soils in Engineering [4]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. Among the properties most important to engineers are permeability, strength, consolidation characteristics, texture, plasticity, and soil reaction. Depth to unconsolidated materials and topography are also important.

Information concerning these and related soil properties is given in tables 5 and 6. The estimates and interpretations in these tables can be used to—

[4] Engineering properties and interpretations for the soils of Garrett County are based on coordinated values established in 1969 by soil scientists and soil conservation engineers representing Pennsylvania, Maryland, Virginia, and West Virginia. THEODORE IFFT, assistant State conservation engineer for Maryland, gave valuable assistance in the preparation of this section.

TABLE 5.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in referring to other series that appear in the first column

| Soil series and map symbols | Depth to bedrock | Depth to seasonal high water table | Depth from surface in typical profile | Classification | | |
|---|---|---|---|---|---|---|
| | | | | Dominant USDA texture | Unified | AASHO |
| | *Ft.* | *Ft.* | *In.* | | | |
| Albrights: AbB, AbC2, AgC | >6 | [1] 1–3 | 0–10 | Silt loam | ML, CL | A–4 |
| | | | 10–18 | Clay loam | ML, CL | A–4, A–6 |
| | | | 18–44 | Loam or clay loam (fragipan) | SC, ML, CL | A–4, A–6 |
| | | | 44–60 | Sandy loam to clay loam | SM, SC, CL | A–2, A–4 |
| Allegheny: AhB | >5 | >5 | 0–10 | Fine sandy loam or loam | SM, ML | A–2, A–4 |
| | | | 10–27 | Loam to silty clay loam | SM, ML, CL | A–4, A–6 |
| | | | 27–60 | Gravelly sandy loam | SM, GM | A–2, A–4 |
| Alluvial land: An, Ao. No estimates. Properties too variable. | | | | | | |
| Andover | >6 | [1] 0 | 0–11 | Silt loam | ML | A–4 |
| Mapped only with Brinkerton soils. | | | 11–24 | Sandy clay loam | SC, ML, CL | A–2, A–4 |
| | | | 24–38 | Loam or sandy clay loam (fragipan). | SM, SC, CL | A–2, A–4 |
| | | | 38–60 | Gravelly loam | SM, SC | A–2, A–4 |
| Armagh: Ar | 3½–6 | 0 | 0–11 | Silt loam | ML, CL | A–4, A–6 |
| | | | 11–44 | Silty clay loam | ML, CL | A–6, A–7 |
| | | | 44 | Soft clay shale. | | |
| Atkins: At | >6 | 0 | 0–7 | Silt loam | ML, CL | A–4, A–6 |
| | | | 7–44 | Silty clay loam | ML, CL | A–4, A–6 |
| | | | 44–60 | Fine sandy loam | SM, ML | A–2, A–4 |
| *Brinkerton: BrA, BrB, BsC | >6 | [1] 0–½ | 0–9 | Silt loam | ML, CL | A–4, A–6 |
| For Andover soils in these units, refer to the Andover series. | | | 9–30 | Silty clay loam | MH, CL, CH | A–6, A–7 |
| | | | 30–50 | Silty clay loam (fragipan) | ML, CL | A–4, A–6 |
| *Calvin: CaC2, CaD2, CaD3, CIE, CnC2, CnD2, CnD3. For Gilpin, Lehew, and Ungers soils in these units, refer to their respective series. | 2–3½ | >3 | 0–18 | Channery loam or silt loam | SM, ML | A–4 |
| | | | 18–24 | Very channery and shaly loam | GM, GC | A–1, A–2 |
| | | | 24 | Fractured shale. | | |
| Cavode: CoB, CoC2 | 3½–6 | ½–1½ | 0–10 | Silt loam | ML, CL | A–4, A–6 |
| | | | 10–60 | Silty clay loam | ML, CL | A–6, A–7 |
| Clymer: CrB | 3½–6 | >5 | 0–9 | Channery loam | ML, GM | A–2, A–4 |
| | | | 9–35 | Clay loam or sandy clay loam | ML, CL, GC | A–2, A–4 |
| | | | 35–44 | Channery sandy loam | SM, GM | A–1, A–2 |
| *Cookport: CtB, CtC2, CuB, CuD. For Ernest soils in CuB and CuD, refer to the Ernest series. | 2½–4 | [1] 1½–3 | 0–8 | Channery loam | SM, ML | A–4 |
| | | | 8–24 | Clay loam | ML, CL | A–4, A–6 |
| | | | 24–38 | Clay loam (fragipan) | ML, CL | A–4 |
| Cut and fill land: Cv. No estimates. Properties too variable. | | | | | | |
| *Dekalb: DbB, DbC2, DbD2, DcC, DcD, DgC, DgD, DIC, DID. For Calvin, Gilpin, Leetonia, and Lehew soils in some of these mapping units, refer to those series. | 1½–3½ | >4 | 0–26 | Channery loam or sandy loam | SM, ML, GM | A–2, A–4 |
| | | | 26–36 | Channery sand or sandy loam | SM, GM | A–2, A–4 |
| | | | 36 | Hard sandstone. | | |

See footnote at end of table.

*significant in engineering*

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for of this table. Symbol > means more than; < means less than]

| Coarse fraction 3 to 10 inches in diameter | Percentage passing sieve— | | | | Permeability | Available water capacity | Reaction unlimed | Shrink-swell potential |
|---|---|---|---|---|---|---|---|---|
| | No. 4 (4.7 mm.) | No. 10 (2.0 mm.) | No. 40 (0.42 mm.) | No. 200 (0.074 mm.) | | | | |
| *Pct.* | | | | | *In./hr.* | *In./in. of soil* | *pH* | |
| 0–15 | 80–100 | 75–100 | 60–90 | 50–85 | 0. 63–6. 3 | 0. 16–0. 20 | 4. 5–5. 5 | Low. |
| 0–10 | 75–95 | 70–85 | 60–75 | 55–80 | 0. 63–2. 0 | 0. 09–0. 14 | 4. 5–5. 5 | Low. |
| 5–15 | 75–95 | 65–85 | 55–80 | 50–75 | 0. 20–0. 63 | 0. 06–0. 10 | 4. 5–5. 5 | Low. |
| 10–20 | 60–85 | 55–80 | 40–60 | 25–60 | 0. 20–2. 0 | 0. 04–0. 08 | 4. 5–6. 0 | Low. |
| 0–5 | 75–100 | 70–100 | 50–100 | 30–80 | 0. 63–6. 3 | 0. 10–0. 18 | 4. 5–5. 5 | Low. |
| 0–5 | 70–100 | 70–100 | 65–95 | 45–95 | 0. 63–2. 0 | 0. 10–0. 14 | 4. 5–5. 5 | Low to moderate. |
| 15–25 | 50–75 | 50–70 | 40–60 | 15–50 | 0. 63–6. 3 | 0. 08–0. 14 | 4. 5–5. 5 | Low. |
| 0–10 | 80–95 | 65–90 | 60–85 | 50–75 | 0. 20–6. 3 | 0. 12–0. 20 | 4. 5–5. 5 | Low. |
| 0–10 | 80–95 | 65–90 | 60–85 | 30–60 | 0. 20–2. 0 | 0. 08–0. 12 | 4. 5–5. 5 | Low. |
| 0–10 | 80–95 | 65–90 | 60–85 | 30–60 | <0. 20 | 0. 08–0. 12 | 4. 5–5. 5 | Low. |
| 5–15 | 70–85 | 60–80 | 55–70 | 25–45 | 0. 20–0. 63 | 0. 06–0. 10 | 4. 5–5. 5 | Low. |
| 0–5 | 95–100 | 90–100 | 80–95 | 75–85 | 0. 63–2. 0 | 0. 18–0. 22 | 4. 0–5. 5 | Low. |
| 0–5 | 85–95 | 80–90 | 70–85 | 65–85 | <0. 20 | 0. 10–0. 14 | 4. 0–5. 5 | Moderate. |
| ---------- | 90–100 | 90–100 | 85–100 | 60–95 | 0. 63–2. 0 | 0. 18–0. 22 | 4. 5–5. 5 | Low. |
| ---------- | 85–100 | 80–100 | 65–75 | 60–75 | 0. 20–0. 63 | 0. 14–0. 18 | 4. 5–5. 5 | Low. |
| 0–10 | 60–95 | 60–80 | 50–70 | 15–60 | 0. 20–6. 3 | 0. 08–0. 12 | 4. 5–5. 5 | Low. |
| 0–5 | 90–100 | 85–100 | 85–100 | 75–100 | 0. 20–2. 0 | 0. 18–0. 24 | 4. 5–6. 0 | Low to moderate. |
| 0–5 | 90–100 | 85–100 | 85–100 | 65–95 | 0. 20–0. 63 | 0. 14–0. 18 | 4. 5–5. 5 | Moderate. |
| 0–5 | 85–100 | 80–100 | 70–100 | 60–90 | <0. 20 | 0. 08–0. 12 | 4. 5–6. 0 | Moderate. |
| 15–25 | 70–95 | 55–90 | 50–90 | 35–75 | 2. 0–6. 3 | 0. 12–0. 18 | 4. 5–5. 5 | Low. |
| 15–40 | 35–70 | 35–60 | 15–45 | 15–35 | 2. 0–6. 3 | 0. 06–0. 10 | 4. 5–5. 5 | Low. |
| 0–5 | 90–100 | 90–100 | 85–95 | 80–90 | 0. 63–2. 0 | 0. 18–0. 22 | 4. 5–5. 5 | Low. |
| 0–10 | 70–95 | 70–95 | 65–90 | 60–90 | <0. 20 | 0. 08–0. 14 | 4. 5–5. 5 | Moderate. |
| 10–20 | 60–85 | 55–70 | 50–70 | 30–55 | 0. 63–6. 3 | 0. 10–0. 14 | 4. 5–5. 5 | Low. |
| 5–15 | 60–85 | 50–70 | 45–65 | 30–55 | 2. 0–6. 3 | 0. 08–0. 12 | 4. 0–5. 0 | Low. |
| 10–30 | 40–70 | 30–60 | 25–40 | 10–20 | 2. 0–6. 3 | 0. 04–0. 08 | 4. 0–5. 0 | Low. |
| 10–15 | 80–95 | 70–90 | 60–80 | 40–70 | 0. 63–6. 3 | 0. 14–0. 18 | 4. 5–5. 5 | Low. |
| 5–20 | 75–95 | 75–95 | 65–90 | 60–75 | 0. 63–2. 0 | 0. 12–0. 16 | 4. 5–5. 5 | Low. |
| 15–30 | 70–90 | 65–85 | 60–80 | 50–55 | <0. 63 | 0. 08–0. 12 | 4. 0–5. 0 | Low. |
| 15–40 | 50–85 | 40–80 | 35–75 | 15–55 | >2. 0 | 0. 06–0. 12 | 4. 0–5. 0 | Low. |
| 20–50 | 40–80 | 35–70 | 25–60 | 15–40 | >2. 0 | 0. 05–0. 10 | 4. 0–5. 0 | Low. |

TABLE 5.—*Estimated soil properties*

| Soil series and map symbols | Depth to bedrock | Depth to seasonal high water table | Depth from surface in typical profile | Classification | | |
|---|---|---|---|---|---|---|
| | | | | Dominant USDA texture | Unified | AASHO |
| | *Ft.* | *Ft.* | *In.* | | | |
| Elkins: Ek | >6 | 0 | 0–11 | Silt loam | OL, ML | A–4, A–6 |
| | | | 11–36 | Silty clay loam | ML, CL | A–4, A–6 |
| | | | 36–76 | Sandy clay loam | SC, ML, CL | A–2, A–4 |
| | | | 76 | Hard sandstone. | | |
| *Ernest: ErA, ErB, ErC2, ErD2 | >4 | [1] 1½–3 | 0–10 | Silt loam | ML, CL | A–4, A–6 |
| | | | 10–30 | Silty clay loam | ML, CL | A–4, A–6 |
| | | | 30–60 | Silt loam or silty clay loam (fragipan). | ML | A–4 |
| *Gilpin: GnB2, GnC2, GnD2, GnD3. | 1½–3½ | >3 | 0–8 | Channery loam or silt loam | ML | A–4 |
| | | | 8–24 | Channery silt loam | ML, CL | A–4, A–6 |
| | | | 24–29 | Channery loam or silt loam | SM, ML, GM | A–2, A–4 |
| | | | 29 | Fractured shale. | | |
| Laidig: LaB, LaD | >6 | [1] >3 | 0–11 | Loam | SM, GM | A–2, A–4 |
| | | | 11–32 | Sandy clay loam | SM, SC, GM | A–2, A–4 |
| | | | 32–76 | Sandy clay loam or sandy loam (fragipan). | SM, SC, GM | A–2, A–4 |
| | | | 76 | Hard sandstone. | | |
| Leetonia Mapped only with Dekalb soils. | 1½–3½ | >4 | 0–8 | Sandy loam | SM, GM | A–2, A–4 |
| | | | 8–16 | Channery sandy loam | SM, GM | A–2, A–4 |
| | | | 16–37 | Sand or loamy sand | SM, GM | A–1, A–2 |
| | | | 37 | Hard sandstone. | | |
| Lehew Mapped only with Calvin, Dekalb, and Ungers soils. | 2–3½ | >4 | 0–18 | Channery loam or loam | SM, GM | A–2, A–4 |
| | | | 18–29 | Very channery sandy loam | SM, GM | A–2, A–4 |
| | | | 29 | Hard sandstone. | | |
| Lickdale: Lc, Ls | 3–6 | 0 | 0–10 | Silt loam | ML | A–4 |
| | | | 10–32 | Silty clay loam to sandy clay loam. | ML, CL | A–4, A–6 |
| | | | 32–46 | Loamy coarse sand | SM | A–1 |
| | | | 46 | Sandstone. | | |
| Meckesville: McB, McC2, MdB, MdD. | >5 | [1] >3 | 0–33 | Silt loam | ML | A–4 |
| | | | 33–44 | Silt loam (fragipan) | ML | A–4 |
| | | | 44–60 | Very shaly loam | GM | A–1, A–2 |
| | | | 60 | Hard sandstone. | | |
| Nolo: NoB | 3½–6 | 0–½ | 0–12 | Silt loam | ML, CL | A–4, A–6 |
| | | | 12–25 | Silty clay loam or clay loam | ML, CL | A–4, A–6 |
| | | | 25–53 | Clay loam to silty clay loam (fragipan). | ML, CL | A–4, A–6 |
| | | | 53 | Sandstone. | | |
| Peat: Pe. No estimates. Properties too variable. | | | | | | |
| Philo: Ph | >6 | 1½–3 | 0–34 | Silt loam | ML | A–4 |
| | | | 34–60 | Silt loam or loam | SM, ML | A–2, A–4 |
| Pope: Ps | >5 | >3 | 0–38 | Silt loam or loam | ML | A–4 |
| | | | 38–50 | Fine sandy loam | SM, ML | A–2, A–4 |
| | | | 50–60 | Loamy sand | SM | A–2 |
| Purdy: PuC2 | >6 | 0 | 0–10 | Silt loam | ML | A–4 |
| | | | 10–21 | Silty clay loam | ML, CL | A–4, A–6 |
| | | | 21–68 | Silty clay | CL | A–6, A–7 |
| Stony land: SrF | 1–3 | >3 | 0–24 | Variable, very stony | SM, GM | A–2, A–4 |
| | | | 24 | Sandstone or shale. | | |

See footnote at end of table.

*significant in engineering*—Continued

| Coarse fraction 3 to 10 inches in diameter | Percentage passing sieve— | | | | Permeability | Available water capacity | Reaction unlimed | Shrink-swell potential |
|---|---|---|---|---|---|---|---|---|
| | No. 4 (4.7 mm.) | No. 10 (2.0 mm.) | No. 40 (0.42 mm.) | No. 200 (0.074 mm.) | | | | |
| *Pct.* | | | | | *In./hr.* | *In./in. of soil* | *pH* | |
| ---------- | 95–100 | 90–100 | 85–95 | 75–90 | 0. 63–2. 0 | 0. 18–0. 24 | 4. 5–5. 5 | Low. |
| ---------- | 95–100 | 90–100 | 85–95 | 75–90 | 0. 06–0. 20 | 0. 12–0. 16 | 4. 5–5. 5 | Moderate. |
| 0–10 | 80–95 | 65–90 | 60–85 | 30–60 | 0. 20–2. 0 | 0. 08–0. 12 | 4. 0–5. 0 | Low. |
| 0–10 | 75–100 | 70–100 | 70–95 | 60–95 | 0. 63–2. 0 | 0. 14–0. 20 | 4. 5–5. 5 | Low. |
| 0–10 | 75–100 | 75–100 | 70–95 | 65–95 | 0. 63–2. 0 | 0. 12–0. 16 | 4. 5–5. 5 | Low to moderate. |
| 5–25 | 75–90 | 65–85 | 60–80 | 50–75 | 0. 20–6. 3 | 0. 08–0. 12 | 4. 5–5. 5 | Low. |
| 10–20 | 85–100 | 80–90 | 70–85 | 60–85 | 0. 63–2. 0 | 0. 16–0. 20 | 4. 5–5. 5 | Low. |
| 20–30 | 75–90 | 70–85 | 60–75 | 55–70 | 0. 63–2. 0 | 0. 08–0. 14 | 4. 5–5. 5 | Low. |
| 20–35 | 40–70 | 35–65 | 25–65 | 15–60 | 0. 63–2. 0 | 0. 06–0. 10 | 4. 5–5. 5 | Low. |
| 0–10 | 55–75 | 50–70 | 40–55 | 20–45 | 0. 63–6. 3 | 0. 10–0. 14 | 4. 5–5. 5 | Low. |
| 5–20 | 55–75 | 50–70 | 40–55 | 20–45 | 0. 63–2. 0 | 0. 08–0. 12 | 4. 0–5. 0 | Low. |
| 5–20 | 50–75 | 45–70 | 40–55 | 15–40 | 0. 20–0. 63 | 0. 06–0. 10 | 4. 0–5. 0 | Low. |
| 0–10 | 55–85 | 45–75 | 35–60 | 25–50 | >6. 3 | 0. 05–0. 08 | 4. 0–5. 0 | Low. |
| 15–25 | 55–75 | 45–70 | 35–60 | 25–50 | >6. 3 | 0. 05–0. 08 | 4. 0–5. 0 | Low. |
| 20–30 | 45–80 | 30–60 | 25–50 | 10–25 | >6. 3 | 0. 02–0. 06 | 4. 0–5. 0 | Low. |
| 10–30 | 50–85 | 45–80 | 40–75 | 20–50 | 2. 0–6. 3 | 0. 08–0. 12 | 4. 5–5. 5 | Low. |
| 30–50 | 45–85 | 35–75 | 30–60 | 15–45 | 2. 0–6. 3 | 0. 06–0. 10 | 4. 5–5. 0 | Low. |
| ---------- | 90–100 | 85–100 | 70–95 | 65–90 | 0. 63–6. 3 | 0. 18–0. 22 | 4. 5–5. 5 | Low. |
| 0–5 | 70–100 | 70–100 | 60–90 | 55–85 | <0. 20 | 0. 10–0. 14 | 4. 5–5. 5 | Moderate. |
| 0–10 | 65–95 | 55–90 | 25–40 | 10–20 | 0. 63–6. 3 | 0. 02–0. 06 | 4. 5–5. 5 | Low. |
| 0–10 | 80–100 | 70–90 | 65–85 | 55–70 | 0. 63–2. 0 | 0. 12–0. 18 | 4. 5–5. 5 | Low. |
| 0–15 | 80–95 | 70–85 | 65–80 | 55–70 | 0. 20–0. 63 | 0. 08–0. 12 | 4. 0–5. 0 | Low. |
| 0–20 | 25–50 | 20–45 | 10–40 | 10–30 | 0. 20–2. 0 | 0. 04–0. 08 | 4. 0–5. 0 | Low. |
| 0–5 | 90–100 | 90–100 | 85–95 | 55–85 | 0. 20–2. 0 | 0. 18–0. 22 | 4. 0–5. 0 | Low. |
| 0–5 | 90–100 | 90–100 | 85–95 | 55–85 | 0. 20–0. 63 | 0. 12–0. 16 | 4. 0–5. 0 | Moderate. |
| 0–10 | 70–100 | 60–90 | 55–85 | 50–70 | <0. 20 | 0. 06–0. 10 | 4. 0–5. 0 | Low to moderate. |
| ---------- | 95–100 | 90–100 | 70–90 | 55–80 | 0. 20–2. 0 | 0. 14–0. 18 | 4. 5–5. 5 | Low. |
| ---------- | 60–85 | 50–70 | 45–60 | 25–55 | 2. 0–6. 3 | 0. 10–0. 14 | 4. 5–5. 5 | Low. |
| 0–5 | 75–100 | 70–100 | 55–85 | 50–65 | 0. 63–6. 3 | 0. 12–0. 16 | 4. 5–5. 5 | Low. |
| 0–5 | 75–100 | 70–100 | 55–85 | 30–55 | 0. 63–6. 3 | 0. 12–0. 16 | 4. 5–5. 5 | Low. |
| 0–5 | 60–75 | 45–60 | 40–55 | 15–25 | 2. 0–6. 3 | 0. 06–0. 10 | 4. 5–5. 5 | Low. |
| ---------- | 95–100 | 90–100 | 90–100 | 90–100 | 0. 20–0. 63 | 0. 18–0. 24 | 4. 5–5. 5 | Low. |
| ---------- | 95–100 | 90–100 | 85–100 | 75–95 | <0. 20 | 0. 12–0. 16 | 4. 5–5. 5 | Moderate. |
| ---------- | 95–100 | 90–100 | 85–95 | 70–95 | <0. 20 | 0. 10–0. 14 | 4. 5–5. 5 | Moderate. |
| 15–50 | 40–85 | 35–80 | 25–75 | 15–50 | >2. 0 | 0. 05–0. 12 | 4. 0–5. 5 | Low. |

TABLE 5.—*Estimated soil properties*

| Soil series and map symbols | Depth to bedrock | Depth to seasonal high water table | Depth from surface in typical profile | Classification | | |
|---|---|---|---|---|---|---|
| | | | | Dominant USDA texture | Unified | AASHO |
| | *Ft.* | *Ft.* | *In.* | | | |
| Strip mines and dumps: St. No estimates. Properties too variable. | | | | | | |
| Swamp: Sw. No estimates. Properties too variable. | | | | | | |
| *Ungers: UcB, UnB. For Calvin, Gilpin, and Lehew soils in these mapping units refer to those series. | 3½–5 | >3 | 0–8<br>8–40<br>40 | Channery loam<br>Silt loam or loam<br>Sandy shale. | SM, GM<br>SM, SC, ML | A–2, A–4<br>A–2, A–4 |
| Very stony land: VsD, VsF. No estimates. Properties too variable. | | | | | | |
| Wharton: WhB2, WhC2 | 3½–6 | 1½–3 | 0–7<br>7–39<br>39–47<br>47 | Silt loam<br>Silty clay<br>Silty clay<br>Clay shale. | ML, CL<br>MH, CL, CH<br>MH, CL, CH | A–4, A–6<br>A–6, A–7<br>A–6, A–7 |

[1] Perched water table.

TABLE 6.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit of this soil is made up of two or more kinds of soil. The soils in referring to other series that appear

| Soils and map symbols | Suitability as source of— | | | Soil features affecting— | |
|---|---|---|---|---|---|
| | Topsoil [1] | Sand and gravel | Road fill | Roads, highways, pipelines, cables [2] | Reservoir sites |
| Albrights silt loam: AbB, AbC2 | Fair to depth of 10 inches. | Not suitable | Fair to good: A–2 to A–6. | Water table; seepage on fragipan; severe frost-heaving potential. | Possible seepage in substratum. |
| Albrights very stony silt loam: AgC. | Poor: very stony. | Not suitable | Fair to good: A–2 to A–6. | Water table; seepage on fragipan; severe frost-heaving potential; very stony. | Possible seepage in substratum. |
| Allegheny fine sandy loam: AhB. | Good to depth of 10 inches. | Generally not suitable; good locally for gravel. | Fair to good: A–2 to A–6. | Features generally favorable. | Pervious substratum. |
| Alluvial land: | | | | | |
| An | Poor to fair | Generally not suitable; good locally for gravel. | Fair to good: A–2 to A–6. | Water table; flood hazard; severe frost-heaving potential. | Flood hazard; variable seepage. |
| Ao | Poor: very stony. | Generally not suitable; good locally for gravel. | Fair to good: A–2 to A–6. | Water table; flood hazard; severe frost-heaving potential; very stony. | Flood hazard; variable seepage. |

See footnotes at end of table.

*significant in engineering*—Continued

| Coarse fraction 3 to 10 inches in diameter | Percentage passing sieve— | | | | Permeability | Available water capacity | Reaction (unlimed) | Shrink-swell potential |
|---|---|---|---|---|---|---|---|---|
| | No. 4 (4.7 mm.) | No. 10 (2.0 mm.) | No. 40 (0.42 mm.) | No. 200 (0.074 mm.) | | | | |
| *Pct.* | | | | | *In./hr.* | *In./in. of soil* | *pH* | |
| 10–20 | 60–95 | 55–90 | 40–70 | 25–50 | 0. 63–2. 0 | 0. 10–0. 16 | 4. 5–5. 5 | Low. |
| 0–10 | 65–95 | 60–90 | 45–70 | 25–55 | 0. 63–2. 0 | 0. 10–0. 14 | 4. 5–5. 5 | Low. |
| 0–5 | 95–100 | 90–100 | 80–95 | 70–95 | 0. 63–2. 0 | 0. 16–0. 20 | 4. 0–5. 5 | Low. |
| 0–5 | 95–100 | 90–100 | 80–95 | 70–95 | 0. 20–0. 63 | 0. 14–0. 18 | 4. 0–5. 5 | Moderate. |
| 0–10 | 80–100 | 75–100 | 70–95 | 65–90 | <0. 20 | 0. 08–0. 12 | 4. 0–5. 0 | Moderate. |

*interpretations*

[Such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for in the first column of this table]

| Soil features affecting—Continued | | | | | |
|---|---|---|---|---|---|
| Embankments [3] | Agricultural drainage | Irrigation | Terraces and diversions | Waterways | Winter grading |
| Fair stability; fair to good compaction; fair resistance to piping. | Seasonal perched water table; moderately slow permeability. | Moderately slow intake rate; moderate water capacity; drainage needed. | Seepage on fragipan; seasonal perched water table. | Seepage on fragipan; moderate water capacity. | Seasonal perched water table; soil forms large frozen clods. |
| Fair stability; fair to good compaction; fair resistance to piping. | Seasonal perched water table; moderately slow permeability; very stony. | Moderately slow intake rate; moderate water capacity; drainage needed; very stony. | Seepage on fragipan; seasonal perched water table; very stony. | Seepage on fragipan; moderate water capacity; very stony. | Seasonal perched water table; soil forms large frozen clods. |
| Good stability and compaction. | Drainage not needed. | Features generally favorable. | Features generally favorable. | Features generally favorable. | Features generally favorable. |
| Variable material. | Variable; flood hazard; outlet problems. | Variable; drainage needed. | Not applicable | High water table; flood hazard. | Water table; flood hazard. |
| Variable material. | Variable; flood hazard; outlet problems; very stony. | Variable; drainage needed; very stony. | Not applicable | High water table; flood hazard; very stony. | Water table; flood hazard. |

TABLE 6.—*Engineering*

| Soils and map symbols | Suitability as source of— | | | Soil features affecting— | |
|---|---|---|---|---|---|
| | Topsoil [1] | Sand and gravel | Road fill | Roads, highways, pipelines, cables [2] | Reservoir sites |
| Andover silt loam. Mapped only with Brinkerton silt loam. | Fair to depth of 10 inches. | Not suitable. | Fair to good: A-2 and A-4. | Water table; seepage on fragipan; severe frost-heaving potential. | Possible seepage in substratum. |
| Andover very stony silt loam. Mapped only with Brinkerton very stony silt loam. | Poor: very stony. | Not suitable. | Fair to good: A-2 and A-4. | Water table; seepage on fragipan; severe frost-heaving potential; very stony. | Possible seepage in substratum. |
| Armagh silt loam: Ar | Fair to depth of 10 inches. | Not suitable. | Poor: A-6 and A-7. | Water table; clayey; bedrock at depth of 3½ to 6 feet; severe frost-heaving potential. | Bedrock at depth of 3½ to 6 feet. |
| Atkins silt loam: At | Fair to depth of 10 inches. | Not suitable. | Fair: A-2 to A-6. | Water table; flood hazard; severe frost-heaving potential. | Flood hazard; pervious substratum. |
| *Brinkerton silt loam: BrA, BrB. For Andover part of these units, see Andover silt loam. | Fair to depth of 10 inches. | Not suitable. | Poor: A-4 to A-7. | Water table; seepage on fragipan; severe frost-heaving potential. | Features generally favorable. |
| *Brinkerton very stony silt loam: BsC. For Andover part of this unit, see Andover very stony silt loam. | Poor: very stony. | Not suitable. | Poor: A-4 to A-7. | Water table; seepage on fragipan; severe frost-heaving potential; very stony. | Features generally favorable. |
| *Calvin channery loam: CaC2, CaD2, CaD3, CIE, CnC2, CnD2, CnD3. For Gilpin part of CaC2, CaD2, and CaD3, see Gilpin channery loam. For Ungers part of CaC2, CaD2, CaD3, CnC2, CnD2, and CnD3, see Ungers channery loam. For Lehew part of CIE, CnC2, CnD2, and CnD3, see Lehew channery loam. | Fair to poor; channery. | Not suitable | Fair to good: A-1 to A-4. | Bedrock at depth of 2 to 3½ feet. | Pervious; bedrock at depth of 2 to 3½ feet. |
| Calvin very stony loam. Mapped only with Dekalb very stony loam. | Poor: very stony. | Not suitable | Fair to good: A-1 to A-4. | Bedrock at depth of 2 to 3½ feet; very stony. | Pervious; bedrock at depth of 2 to 3½ feet. |
| Cavode silt loam: CoB, CoC2 | Fair to depth of 10 inches. | Not suitable | Poor: A-6 and A-7. | Water table; severe frost-heaving potential. | Bedrock at depth of 3½ to 6 feet. |
| Clymer channery loam: CrB | Fair to depth of 10 inches. | Poor | Good: A-1 to A-4. | Bedrock at depth of 3½ to 6 feet. | Pervious; bedrock at depth of 3½ to 6 feet. |

See footnotes at end of table.

*interpretations*—Continued

| Soil features affecting—Continued | | | | | |
|---|---|---|---|---|---|
| Embankments [3] | Agricultural drainage | Irrigation | Terraces and diversions | Waterways | Winter grading |
| Good stability and compaction. | Seasonal perched water table; slow permeability. | Slow intake rate; moderate water capacity; drainage needed. | Seepage on fragipan; seasonal perched water table. | Seepage on fragipan; moderate water capacity. | Water table; soil forms large frozen clods. |
| Good stability and compaction. | Seasonal perched water table; slow permeability. | Slow intake rate; moderate water capacity; drainage needed; very stony. | Seepage on fragipan; seasonal perched water table; very stony. | Seepage on fragipan; moderate water capacity; very stony. | Water table; soil forms large frozen clods. |
| Poor stability; clayey; poor compaction. | High water table; slow permeability. | Slow intake rate; drainage needed. | High water table | High water table | Water table; plastic material; soil forms large frozen clods. |
| Poor stability; erodible. | High water table; moderately slow permeability; outlet problems. | Moderately slow intake rate; drainage needed. | Not applicable | High water table; flood hazard. | Water table; flood hazard; soil forms large frozen clods. |
| Poor stability and compaction. | Seasonal perched water table; slow permeability. | Slow intake rate; drainage needed. | Seepage on fragipan; seasonal perched water table. | Seepage on fragipan; seasonal perched water table. | Water table; soil forms large frozen clods. |
| Poor stability and compaction. | Seasonal perched water table; slow permeability; very stony. | Slow intake rate; drainage needed; very stony. | Seepage on fragipan; perched water table; very stony. | Seepage on fragipan; perched water table; very stony. | Water table; soil forms large frozen clods. |
| Fair to good stability and compaction; limited quantity. | Drainage not needed. | Moderately rapid intake rate; low water capacity. | Bedrock at depth of 2 to 3½ feet. | Bedrock at depth of 2 to 3½ feet; low water capacity. | Features generally favorable. |
| Fair to good stability and compaction; limited quantity. | Drainage not needed. | Moderately rapid intake rate; low water capacity; very stony. | Bedrock at depth of 2 to 3½ feet; very stony. | Bedrock at depth of 2 to 3½ feet; low water capacity; very stony. | Features generally favorable. |
| Poor to fair stability and compaction. | Water table; slow permeability. | Slow intake rate; drainage needed. | Water table | Water table | Water table; soil forms large frozen clods. |
| Good stability and compaction. | Drainage not needed. | Moderately rapid intake rate; moderate water capacity. | Features generally favorable. | Features generally favorable. | Features generally favorable. |

TABLE 6.—*Engineering*

| Soils and map symbols | Suitability as source of— | | | Soil features affecting— | |
|---|---|---|---|---|---|
| | Topsoil [1] | Sand and gravel | Road fill | Roads, highways, pipelines, cables [2] | Reservoir sites |
| Cookport channery loam: CtB, CtC2. | Fair to depth of 8 inches. | Not suitable | Fair: A–4 and A–6. | Water table; seepage on fragipan; severe frost-heaving potential; bedrock at depth of 2½ to 4 feet. | Bedrock at depth of 2½ to 4 feet. |
| *Cookport very stony silt loam: CuB, CuD. For Ernest part of these units, see Ernest very stony silt loam. | Poor: very stony. | Not suitable | Fair: A–4 and A–6. | Water table; seepage on fragipan; severe frost-heaving potential; bedrock at depth of 2½ to 4 feet; very stony. | Bedrock at depth of 2½ to 4 feet. |
| Cut and fill land: Cv. Properties too variable to rate. Onsite inspection required. | | | | | |
| *Dekalb channery loam: DbB, DbC2, DbD2. | Poor | Poor | Fair to good: A–2 and A–4. | Bedrock at depth of 1½ to 3½ feet. | Pervious; bedrock at depth of 1½ to 3½ feet. |
| *Dekalb very stony loam: DcC, DcD, DgC, DgD. For Calvin part of DcC and DcD, see Calvin very stony loam. For Lehew part of DcC and DcD, see Lehew very stony loam. For Gilpin part of DgC and DgD, see Gilpin very stony loam. | Poor: very stony. | Poor | Fair to good: A–2 and A–4. | Bedrock at depth of 1½ to 3½ feet; very stony. | Pervious; bedrock at depth of 1½ to 3½ feet. |
| *Dekalb very stony sandy loam: DlC, DlD. For Leetonia part of these units, see Leetonia very stony sandy loam. | Poor: very stony. | Poor | Fair to good: A–2 and A–4. | Bedrock at depth of 1½ to 3½ feet; very stony. | Pervious; bedrock at depth of 1½ to 3½ feet. |
| Elkins silt loam: Ek | Fair to depth of 10 inches. | Not suitable | Poor: A–4 and A–6; organic. | Water table; flood hazard; severe frost-heaving potential. | Flood hazard |
| Ernest silt loam: ErA, ErB, ErC2, ErD2. | Fair to depth of 10 inches. | Not suitable | Fair: A–4 and A–6. | Water table; seepage on fragipan; severe frost-heaving potential. | Bedrock below depth of 4 feet. |
| Ernest very stony silt loam Mapped only with Cookport very stony silt loam. | Poor: very stony. | Not suitable | Fair: A–4 and A–6. | Water table; seepage on fragipan; severe frost-heaving potential; very stony. | Bedrock below depth of 4 feet. |
| Gilpin channery loam: GnB2, GnC2, GnD2, GnD3. | Fair to depth of 10 inches. | Not suitable | Fair: A–2 to A–6. | Bedrock at depth of 1½ to 3½ feet. | Pervious; bedrock at depth of 1½ to 3½ feet. |
| Gilpin very stony loam Mapped only with Dekalb very stony loam. | Poor: very stony. | Not suitable | Fair: A–2 to A–6. | Bedrock at depth of 1½ to 3½ feet; very stony. | Pervious; bedrock at depth of 1½ to 3½ feet. |

See footnotes at end of table.

*interpretations*—Continued

| Soil features affecting—Continued | | | | | |
|---|---|---|---|---|---|
| Embankments [3] | Agricultural drainage | Irrigation | Terraces and diversions | Waterways | Winter grading |
| Fair stability and compaction. | Seasonal perched water table; moderately slow to slow permeability. | Moderately slow to slow intake rate; drainage needed. | Seepage on fragipan; seasonal perched water table. | Seepage on fragipan; seasonal perched water table. | Water table; soil forms large frozen clods. |
| Fair stability and compaction. | Seasonal perched water table; moderately slow to slow permeability; very stony. | Moderately slow to slow intake; drainage needed; very stony. | Seepage on fragipan; seasonal perched water table; very stony. | Seepage on fragipan; seasonal perched water table; very stony. | Water table; soil forms large frozen clods. |
| Fair to good stability and compaction; permeable when compacted. | Drainage not needed. | Moderately rapid intake rate; low water capacity. | Bedrock at depth of 1½ to 3½ feet. | Bedrock at depth of 1½ to 3½ feet. | Features generally favorable. |
| Fair to good stability and compaction; permeable when compacted. | Drainage not needed. | Moderately rapid intake rate; low water capacity; very stony. | Bedrock at depth of 1½ to 3½ feet; very stony. | Bedrock at depth of 1½ to 3½ feet; very stony. | Features generally favorable. |
| Fair to good stability and compaction; permeable when compacted. | Drainage not needed. | Moderately rapid intake rate; low water capacity; very stony. | Bedrock at depth of 1½ to 3½ feet; very stony. | Bedrock at depth of 1½ to 3½ feet; very stony. | Features generally favorable. |
| Poor to fair stability and compaction. | High water table; slow permeability; outlet problems. | Slow intake rate; drainage needed. | Not applicable | High water table; flood hazard. | Water table; flood hazard; soil forms large frozen clods. |
| Poor to fair stability and compaction. | Seasonal perched water table; moderately slow permeability. | Moderate intake rate; drainage needed. | Seepage on fragipan; seasonal perched water table. | Seepage on fragipan; seasonal perched water table. | Water table; soil forms large frozen clods. |
| Poor to fair stability and compaction. | Seasonal perched water table; moderately slow permeability; very stony. | Moderate intake rate; drainage needed; very stony. | Seepage on fragipan; seasonal perched water table; very stony. | Seepage on fragipan; seasonal perched water table; very stony. | Water table; soil forms large frozen clods. |
| Fair stability and compaction. | Drainage not needed. | Moderate intake rate and water capacity. | Bedrock at depth of 1½ to 3½ feet. | Bedrock at depth of 1½ to 3½ feet. | Features generally favorable. |
| Fair stability and compaction. | Drainage not needed. | Moderate intake rate and water capacity; very stony. | Bedrock at depth of 1½ to 3½ feet; very stony. | Bedrock at depth of 1½ to 3½ feet; very stony. | Features generally favorable. |

TABLE 6.—*Engineering*

| Soils and map symbols | Suitability as source of— | | | Soil features affecting— | |
|---|---|---|---|---|---|
| | Topsoil [1] | Sand and gravel | Road fill | Roads, highways, pipelines, cables [2] | Reservoir sites |
| Laidig very stony loam: LaB, LaD. | Poor: very stony. | Not suitable | Good: A–2 and A–4. | Seepage on fragipan; moderate frost-heaving potential; very stony. | Bedrock below depth of 6 feet. |
| Leetonia very stony sandy loam. Mapped only with Dekalb very stony sandy loam. | Poor: very stony. | Fair for sand; limited quantity. | Fair to good: A–1 to A–4. | Bedrock at depth of 1½ to 3½ feet; very stony. | Highly pervious; bedrock at depth of 1½ to 3½ feet. |
| Lehew channery loam. Mapped with Calvin and Ungers channery loams. | Fair | Not suitable | Fair to good: A–2 and A–4. | Bedrock at depth of 2 to 3½ feet. | Pervious; bedrock at depth of 2 to 3½ feet. |
| Lehew very stony loam. Mapped only with Dekalb very stony loam. | Poor: very stony. | Not suitable | Fair to good: A–2 and A–4. | Bedrock at depth of 2 to 3½ feet; very stony. | Pervious; bedrock at depth of 2 to 3½ feet. |
| Lickdale silt loam: Lc | Fair to depth of 10 inches. | Not suitable | Poor: A–6 to A–4. | Water table; bedrock at depth of 3 to 6 feet; severe frost-heaving potential. | Bedrock at depth of 3 to 6 feet. |
| Lickdale very stony silt loam: Ls. | Poor: very stony. | Not suitable | Poor: A–6 to A–4. | Water table; bedrock at depth of 3 to 6 feet; severe frost-heaving potential; very stony. | Bedrock at depth of 3 to 6 feet. |
| Meckesville silt loam: McB, McC2. | Good to depth of 10 inches. | Not suitable | Good: A–1 to A–4. | Seepage on fragipan; moderate frost-heaving potential. | Features generally favorable. |
| Meckesville very stony silt, loams: MdB, MdD. | Poor: very stony. | Not suitable | Good: A–1 to A–4. | Seepage on fragipan; moderate frost-heaving potential; very stony. | Features generally favorable. |
| Nolo silt loam: NoB | Fair to depth of 10 inches. | Not suitable | Fair to poor: A–4 and A–6. | Water table; bedrock at depth of 3½ to 6 feet; severe frost-heaving potential. | Bedrock at depth of 3½ to 6 feet. |
| Peat: Pe | Poor [4] | Not suitable | Not suitable | Ponding; extremely poor stability and bearing capacity; very severe frost-heaving potential. | Clay substratum at depth of about 6 feet. |
| Philo silt loam: Ph | Fair to depth of 40 inches. | Not suitable, to fair locally. | Fair: A–2 and A–4. | Water table; flood hazard; severe frost-heaving potential. | Flood hazard; pervious substratum locally. |

See footnotes at end of table.

*interpretations*—Continued

| Soil features affecting—Continued | | | | | |
|---|---|---|---|---|---|
| Embarkments [3] | Agricultural drainage | Irrigation | Terraces and diversions | Waterways | Winter grading |
| Fair to good stability and compaction. | Drainage not needed. | Moderately slow intake rate; very stony. | Seepage on fragipan; very stony. | Seepage on fragipan; very stony. | Features generally favorable. |
| Good stability and compaction; permeable when compacted. | Drainage not needed. | Rapid intake rate; low water capacity; very stony. | Sandy; bedrock at depth of 1½ to 3½ feet; very stony. | Bedrock at depth of 1½ to 3½ feet; very stony. | Features generally favorable. |
| Fair to good stability and compaction; permeable when compacted. | Drainage not needed. | Moderately rapid intake rate; low water capacity. | Bedrock at depth of 2 to 3½ feet. | Bedrock at depth of 2 to 3½ feet. | Features generally favorable. |
| Fair to good stability and compaction; permeable when compacted. | Drainage not needed. | Moderately rapid intake rate; low water capacity; very stony. | Bedrock at depth of 2 to 3½ feet; very stony. | Bedrock at depth of 2 to 3½ feet; very stony. | Features generally favorable. |
| Poor to fair stability and compaction. | High water table; slow permeability; outlet problems. | Slow intake rate; drainage needed. | High water table---- | High water table---- | Water table; soil forms large frozen clods. |
| Poor to fair stability and compaction. | High water table; slow permeability; outlet problems; very stony. | Slow intake rate; drainage needed; very stony. | High water table; very stony. | High water table; very stony. | Water table; soil forms large frozen clods. |
| Fair stability and compaction; piping hazard. | Drainage not needed. | Moderately slow intake rate. | Seepage on fragipan-- | Seepage on fragipan-- | Features generally favorable. |
| Fair stability and compaction; piping hazard. | Drainage not needed. | Moderately slow intake rate; very stony. | Seepage on fragipan; very stony. | Seepage on fragipan; very stony. | Features generally favorable. |
| Fair stability and compaction. | High water table; slow permeability. | Slow intake rate; drainage needed. | High water table; seepage on fragipan. | High water table; seepage on fragipan. | Water table; soil forms large frozen clods. |
| Not suitable------ | Ponding; excessive shrinkage and subsidence; outlet problems. | Drainage needed; very low fertility and extreme acidity. | Not applicable------ | Not applicable------ | Ponding; freezes to solid mass. |
| Fair stability and compaction; piping hazard. | Water table; outlet problems. | Moderate to moderately slow intake rate; drainage needed. | Not applicable------ | Water table; flood hazard. | Water table; soil forms large frozen clods; flood hazard. |

TABLE 6.—*Engineering*

| Soils and map symbols | Suitability as source of— | | | Soil features affecting— | |
|---|---|---|---|---|---|
| | Topsoil [1] | Sand and gravel | Road fill | Roads, highways, pipelines, cables [2] | Reservoir sites |
| Pope silt loam: Ps | Good to depth of 40 inches. | Not suitable, to fair locally. | Fair to good: A–2 and A–4. | Flood hazard; moderate frost-heaving potential. | Flood hazard; pervious substratum. |
| Purdy silt loam: PuC2 | Fair to depth of 10 inches. | Not suitable | Poor: A–4 to A–7. | Water table; clayey; severe frost-heaving potential. | Features generally favorable. |
| Stony land: SrF | Poor: very stony. | Not suitable | Fair to good: A–2 and A–4; limited quantity. | Bedrock at depth of 1 to 3 feet; very stony. | Bedrock at depth of 1 to 3 feet. |
| Strip mines and dumps: St. Properties too variable to rate. Onsite inspection required. | | | | | |
| Swamp: Sw. Properties too variable to rate. Onsite inspection required. | | | | | |
| *Ungers channery loam: UcB, UnB. For Calvin part of these units, see Calvin channery loam. For Lehew part of UcB, see Lehew channery loam. For Gilpin part of UnB, see Gilpin channery loam. | Fair to depth of 20 inches. | Not suitable | Fair to good: A–2 and A–4. | Bedrock at depth of 3½ to 5 feet. | Pervious: bedrock at depth of 3½ to 5 feet. |
| Very stony land: VsD, VsF | Not suitable; extremely stony. | Not suitable | Fair: extremely stony; limited quantity. | Bedrock at surface to depth of 2 feet; extremely stony. | Pervious; bedrock at surface to depth of 2 feet. |
| Wharton silt loam: WhB2, WhC2. | Fair to depth of 6 inches. | Not suitable | Poor: A–6 and A–7. | Water table; clayey; severe frost-heaving potential; bedrock at depth of 3½ to 6 feet. | Bedrock at depth of 3½ to 6 feet. |

[1] All severely eroded soils are poor to very poor as a source of topsoil.

[2] Frost heaving potential applies only to roads and highways; it is not an important factor for properly buried pipelines and cables. For effects of slope gradient, refer to table 7.

[3] Includes dams, dikes, and levees.

*interpretations*—Continued

| Soil features affecting—Continued | | | | | |
|---|---|---|---|---|---|
| Embankments [3] | Agricultural drainage | Irrigation | Terraces and diversions | Waterways | Winter grading |
| Fair to good stability and compaction; piping hazard. | Drainage not needed. | Moderate to moderately rapid intake rate. | Not applicable | Flood hazard | Flood hazard. |
| Poor stability and compaction; clayey. | High water table; slow permeability. | Slow intake rate; drainage needed. | High water table | High water table | Water table; soil forms large frozen clods. |
| Fair to good stability and compaction; limited quantity. | Drainage not needed. | Moderate intake rate; low water capacity; very stony. | Bedrock at depth of 1 to 3 feet; very stony. | Bedrock at depth of 1 to 3 feet; very stony. | Features generally favorable. |
| Fair to good stability and compaction. | Drainage not needed. | Moderate intake rate and water capacity. | Bedrock at depth of 3½ to 5 feet. | Bedrock at depth of 3½ to 5 feet. | Features generally favorable. |
| Extremely stony; limited quantity. | Drainage not needed. | Not applicable | Bedrock at surface to depth of 2 feet; extremely stony. | Bedrock at surface to depth of 2 feet; extremely stony. | Features generally favorable. |
| Poor stability and compaction; clayey. | Seasonal water table; slow permeability. | Slow intake rate; drainage needed. | Water table; may slip when saturated. | Water table; may slip when saturated. | Water table; plastic material; soil forms large frozen clods. |

[4] Although peat is poor for topsoil, mixing it with other soils can be helpful in improving moisture relationships and workability. The peat of Garrett County is extremely acid, and although this may be satisfactory for certain acid-tolerant plants when used as a soil conditioner, larger amounts of lime may be needed for plants that tolerate nonacid or only slightly acid soils.

1. Make studies that will aid in selecting and developing industrial, commercial, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils in planning drainage systems, farm ponds, irrigation systems, terraces, waterways, and diversion terraces.
3. Make preliminary evaluations of soil conditions that will aid in selecting sites for highways, airports, pipelines, and cables and in planning detailed investigations at selected locations.
4. Locate probable sources of gravel, sand, and other construction material.
5. Correlate performance of soil mapping units to develop information that will be useful in planning engineering practices and in designing and maintaining engineering structures.
6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement other publications, such as maps, reports, and aerial photographs, that are used in preparation of engineering reports for a specific area.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

The engineering interpretations reported here 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 reported (ordinarily about 5 feet). Even in these situations, however, the soil map is useful in planning more detailed field investigations and in indicating the kinds of problems that may be expected.

Some of the terms used by soil scientists have a special meaning in soil science and a different meaning in engineering. Some of these terms are defined in the Glossary.

### *Engineering classification of the soils*

The two systems most commonly used in classifying soils for engineering are the systems approved by the American Association of State Highway Officials (AASHO) and the Unified system.

The AASHO system (*1*) is used to classify soils according to those properties that affect use in highway construction. In this system all soil material is classified in seven principal groups. The groups range from A–1, which consists of soils that have the highest bearing strength and are the best soils for subgrade, to A–7, which consists of soils that have the lowest strength when wet.

In the Unified system (*7*) soils are classified according to their texture and plasticity and their performance as engineering construction material. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. GP and GW are clean gravels, and GM and GC are gravels that include, respectively, an appreciable amount of nonplastic and plastic fines. SP and SW are clean sands. SM and SC are sands that include fines of silt and clay. ML and CL are silts and clays that have a low liquid limit, and MH and CH are silts and clays that have a high liquid limit. Soils on the borderline between two classes are designated by symbols for both classes; for example, ML–CL.

Soil scientists use the USDA textural classification (*5*). In this system, the texture of the soil is determined according to the proportion of soil particles smaller than 2 millimeters in diameter, that is, the proportion of sand, silt, and clay. Textural modifiers, such as gravelly, stony, shaly, and cobbly, are used as needed.

Table 5 shows the estimated classification of all the soils in the county according to all three systems of classification.

### *Estimated properties of the soils*

Table 5 shows estimated properties that are important in engineering, and it gives estimated Unified and AASHO classifications for the soils. These classifications are based on data obtained on these soils in other survey areas by mechanical analyses and by tests made to determine plastic properties of the soil. The textural terms used to describe the soil material in the main horizons of the profiles are those used by the U.S. Department of Agriculture.

Depth to high water table refers to the highest level at which ground water stands for a significant period of time. This depth, and the depth to bedrock, coincides with the normal range for each soil series.

The thickness and other properties given in table 5 cover the general range found in the soil profiles, including the specific example described in the section "Descriptions of the Soils." However, some horizons in table 5 have been combined, so thicknesses do not necessarily coincide with those given in the soil descriptions. In table 5, the thickness of the surface layer applies only to soils that are slightly or only moderately eroded. The surface layer of severely eroded soils is thinner or may be completely lacking, and the underlying horizons are nearer the surface than is indicated in the table.

The permeability of a soil horizon is the rate at which water moves downward through undisturbed soil material. It depends largely on the texture and structure of the soil.

Available water capacity is the water held in the range between field capacity and the wilting point. It is expressed in table 5 as inches of water per inch of soil.

Reaction refers to the acidity or alkalinity of the soil, expressed in terms of pH values. A pH of 7.0 is neutral, values of less than 7.0 indicate acidity, and values of more than 7.0 indicate alkalinity. The reactions given in table 4 are the normal ones for soils that are unlimed. In fields that have been limed, the pH value is higher, particularly in the surface layer and the layer just beneath it.

Shrink-swell potential is an indication of the volume change that can be expected with changes in moisture content. It depends largely on the amount and kind of clay in the soil. In general, soils classified as CH or A–7 have high shrink-swell potential, and sands and gravels have low shrink-swell potential.

Coarse fragments are that portion of the soil consisting of gravel larger than 3 inches in diameter.

*Figure 9.*—**An impounded pond near Oakland. The site is in a poorly drained, slowly permeable soil.**

Percentages passing specified sieve sizes are based on that portion of the soil that excludes all fragments larger than 3 inches in diameter.

### *Engineering interpretations*

Table 6 rates the soils of Garrett County according to their suitability as potential sources of topsoil, sand and gravel, and road fill.

No soils of the county are good sources of sand, and only the Allegheny soils and Alluvial land in places are good sources of gravel. A few other soils, as shown in the table, are poor to fair sources of sand or gravel.

Also listed in table 6 are soil features that affect different kinds of engineering work. The features shown are those that affect the location of roads and highways and the location and installation of pipelines and underground cables; sites for ponds or reservoirs; the use of soil material for embankments for dams, dikes, and levees; agricultural drainage systems; sprinkler irrigation systems; the construction and maintenance of terraces, diversions, and waterways; and winter grading of soils.

Features that affect laying pipelines or underground cables are the height of the water table, probable seepage, the hazard of flooding, stoniness of the soil, and depth to hard bedrock. For example, if the water table is high, laying a pipeline is difficult because excavations are likely to collapse.

Factors considered for a road or highway location are essentially the same as for a pipeline, in addition to the expected severity of frost heaving of subgrades.

Choice of a pond or reservoir site depends not only upon a reliable source of water from surface runoff, streamflow, or ground water, but also on the soils lining the impoundment and the kinds of soils through which water loss by seepage can occur. Figure 9 shows a surface water impoundment in a slowly permeable, poorly drained soil.

Stability, permeability, and compaction characteristics affect the choice of soil materials for building dams, dikes, levees, and other embankments. The density to which soil material can be compacted affects the strength and permeability of the structure, and soils that can be compacted to the greatest density have the greatest strength and stability and generally allow the least seepage loss. Soils that are well-graded mixtures of gravel, sand, and fine material are the most easily compacted to a high density. Some highly clayey materials are difficult to compact and have little strength, but because they are very slowly permeable they can be used for cores within embankments of coarser materials to prevent possible excessive water losses.

The ease or difficulty with which a soil can be drained artificially is determined mainly by the least permeable layer and by the height and fluctuation of the water table. Stoniness in wet soils also hinders the installation of ditches and tile systems.

Soil features that affect the design of a sprinkler irrigation system are the rate at which applied water can move into and through the soil, the capacity of the soil to retain moisture, and the need of the soil for drainage im-

provement. Other features that affect irrigation are stoniness and the hazard of flooding.

In planning and designing terraces and diversions, the features of special concern are the height of the water table, seepage, stoniness, the possible presence of rock ledges, and the depth to and kind of bedrock. These features, in addition to the available water capacity of the soil and the hazard of flooding, strongly affect the design of constructed waterways and the kinds of vegetation that are needed for stabilizing them.

Winter grading is influenced by winter wetness and depth and severity of freezing, and by the trafficability of the soil, which means the ease or difficulty of moving grading equipment over the surface.

It is again emphasized that the interpretations given in table 6 are not a substitute for onsite investigation but are a guide to what can be reasonably expected within any delineation on the soil map.

## Town and Country Planning

Garrett County is primarily a rural area dominated by woodlands and farms. However, there are increases in recreational and other nonfarm uses of the land, particularly in the environs of Deep Creek Lake, and the increases will probably continue.

Accompanying the increase in recreational, residential, commercial, and industrial development is a growing need for information about soil conditions that affect these nonfarm uses. The most common need is for information about limitations of the soils for disposing of sewage effluent from septic tanks. Information about soil conditions affecting other uses, particularly building foundations, streets and parking lots, landfill operations, and some kinds of outdoor recreation are also important.

Table 7 gives limitations of the soils of the county for selected nonfarm uses, and table 8 gives limitations for specified recreational uses. In these tables, the soils are given ratings of slight, moderate, or severe, according to the degree that the soil is limited for the specific use. These ratings are based on the degree of the greatest limitation, whether it be for one or more reasons. For example, a steep slope severely limits the use of a soil for playgrounds, but the soil is only slightly or moderately limited for the same use by such factors as stoniness or a seasonal moderately high water table.

A rating of slight can indicate that a soil has no limitation at all, although most soils are at least slightly limited for almost any use.

A rating of moderate means that the limitation can be tolerated or can be practically and economically corrected. For example, a moderate limitation because of a seasonal high water table may be tolerated, though not desired, if it affects lawns and landscaping as it does for Cavode silt loam. Another moderate limitation because of slope, as it affects playgrounds, can be overcome by land leveling.

A rating of severe for a particular use means that the limitation cannot be tolerated or overcome, or it can mean that the limitation can be overcome, but only at great effort or expense that may not be justified. For example, a soil having a high water table is severely limited in its use for cemeteries, but it may be so used if measures are taken to improve drainage and lower the water table. Likewise, a soil that is less than 1 foot deep over bedrock can be used as a site for a home with a basement if excavation effort and expense can be justified.

Following are the main properties that limit the soils of Garrett County for the uses shown in tables 7 and 8:

*Filter fields for sewage disposal.*—Permeability of the soil; depth to water table; depth to bedrock; slope; and the hazard of flooding.

*Lagoons for sewage disposal.*—Permeability of the soil; depth to bedrock; organic-matter content; slope; and the hazard of flooding.

*Homesites.*—Depth to water table; depth to bedrock; kind or hardness of bedrock; stoniness; slope; and the hazard of flooding. Critical depths to water table and to bedrock are less for homes without basements than for homes with basements.

*Streets and parking lots.*—Depth to water table; depth to and kind of bedrock; slope; and the hazard of flooding.

*Landfill and cemeteries.*—Depth to water table; depth to hard bedrock; stoniness; permeability; slope; and the hazard of flooding.

*Lawns, fairways, and landscaping.*—Depth to water table and to bedrock; surface soil texture; stoniness; slope; and the hazard of flooding.

*Camp areas.*—Depth to water table; soil permeability; stoniness; slope; and the hazard of flooding.

*Playgrounds (includes athletic fields).*—Depth to water table and to bedrock; soil permeability; surface texture; stoniness; other coarse fragments in the soil; slope; and the hazard of flooding.

*Picnic areas and paths and trails.*—Depth to water table; stones or other coarse fragments in the soil; slope; and the hazard of flooding.

A soil property has different effects on limitations for different uses. For example, slope most strongly affects sewage lagoons, streets and parking lots, and playgrounds and has the least effect on paths and trails. As another example, slow soil permeability severely limits use of the soil for filter fields but is a desirable characteristic for sewage lagoons.

Tables 7 and 8, in combination with the soil map, are reliable guides to the degree of ease or difficulty to be expected in using the soils of the county for nonfarm purposes. However, all soils are variable in characteristics; their most common variations are given in detail in the descriptions of the soil series, and some less common, but important, variations are given in the descriptions of the mapping units. For these reasons, an onsite investigation is always desirable, particularly for such uses as septic filter fields, building foundations, and playgrounds.

A number of mapping units in tables 7 and 8 consist of two or more soils, for example, Ungers-Gilpin-Calvin channery loams, 0 to 10 percent slopes, and Brinkerton and Andover silt loams, 0 to 3 percent slopes. Although the soils in such a unit differ in some respects, the limitations given for the unit apply equally to all of the named soils in the unit, unless otherwise noted in the tables.

TABLE 7.—*Soil limitations for town and country planning*

| Soils and map symbols | Sewage disposal | | Homesites (buildings three stories or less) | | Streets and parking lots | Land fill and cemeteries |
|---|---|---|---|---|---|---|
| | Filter fields | Lagoons | With basements | Without basements | | |
| Albrights silt loam: | | | | | | |
| AbB | Severe: moderately slow permeability. | Slight to moderate: 0 to 8 percent slopes.[1] | Moderate: seasonal moderately high water table. | Slight | Moderate: seasonal moderately high water table; 0 to 8 percent slopes. | Severe: seasonal moderately high water table. |
| AbC2 | Severe: moderately slow permeability. | Severe: 8 to 15 percent slopes. | Moderate: seasonal moderately high water table; 8 to 15 percent slopes. | Moderate: 8 to 15 percent slopes. | Severe: 8 to 15 percent slopes. | Severe: seasonal moderately high water table. |
| Albrights very stony silt loam: AgC. | Severe: moderately slow permeability. | Slight to severe: 0 to 15 percent slopes.[1] | Moderate: seasonal moderately high water table; 0 to 15 percent slopes; very stony. | Moderate: 0 to 15 percent slopes; very stony. | Moderate to severe: seasonal moderately high water table; 0 to 15 percent slopes.[1] | Severe: seasonal moderately high water table; very stony. |
| Allegheny fine sandy loam: AhB. | Slight[2] | Moderate: moderate permeability; 0 to 8 percent slopes.[2] | Slight | Slight | Slight to moderate: 0 to 8 percent slopes.[1] | Slight.[2] |
| Alluvial land: | | | | | | |
| An | Severe: high water table; flood hazard.[2] | Severe: flood hazard.[2] | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard.[2] |
| Ao | Severe: high water table; flood hazard.[2] | Severe: flood hazard.[2] | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard; very stony.[2] |
| Armagh silt loam: Ar | Severe: high water table; slow permeability. | Slight | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. |
| Atkins silt loam: At | Severe: high water table; moderately slow permeability; flood hazard.[2] | Severe: flood hazard.[2] | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard.[2] |
| Brinkerton and Andover silt loams: | | | | | | |
| BrA | Severe: high water table; slow permeability. | Slight | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. |
| BrB | Severe: high water table; slow permeability. | Moderate: 3 to 8 percent slopes. | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. |

See footnotes at end of table.

TABLE 7.—*Soil limitations for town and country planning*—Continued

| Soils and map symbols | Sewage disposal | | Homesites (buildings three stories or less) | | Streets and parking lots | Land fill and cemeteries |
|---|---|---|---|---|---|---|
| | Filter fields | Lagoons | With basements | Without basements | | |
| Brinkerton and Andover very stony silt loams: BsC | Severe: high water table; slow permeability. | Slight to severe: 0 to 15 percent slopes.[1] | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table; very stony. |
| Calvin-Gilpin-Ungers channery loams: CaC2 | Severe: 1½ to 3½ feet depth to bedrock; 10 to 20 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock; 10 to 20 percent slopes. | Moderate to severe: 1½ to 3½ feet depth to bedrock; slopes.[3] | Moderate to severe: 10 to 20 percent slopes.[3] | Severe: 10 to 20 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock; 10 to 20 percent slopes. |
| CaD2, CaD3 | Severe: 1½ to 3½ feet depth to bedrock; 20 to 35 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock; 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock; 20 to 35 percent slopes. |
| Calvin and Lehew channery loams: ClE. | Severe: 2 to 3½ feet depth to bedrock; 35 to 50 percent slopes. | Severe: 2 to 3½ feet depth to bedrock; 35 to 50 percent slopes. | Severe: 35 to 50 percent slopes. | Severe: 35 to 50 percent slopes. | Severe: 35 to 50 percent slopes. | Severe: 2 to 3½ feet depth to bedrock; 35 to 50 percent slopes. |
| Calvin, Ungers and Lehew channery loams: CnC2 | Severe: 2 to 3½ feet depth to bedrock; 10 to 20 percent slopes. | Severe: 2 to 3½ feet depth to bedrock; 10 to 20 percent slopes. | Moderate to severe: 2 to 3½ feet depth to bedrock; 10 to 20 percent slopes.[3] | Moderate to severe: 10 to 20 percent slopes.[3] | Severe: 10 to 20 percent slopes. | Severe: 2 to 3½ feet depth to bedrock; 10 to 20 percent slopes. |
| CnD2, CnD3 | Severe: 2 to 3½ feet depth to bedrock; 20 to 35 percent slopes. | Severe: 2 to 3½ feet depth to bedrock; 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 2 to 3½ feet depth to bedrock; 20 to 35 percent slopes. |
| Cavode silt loam: CoB | Severe: seasonal high water table; slow permeability. | Slight to moderate: 0 to 8 percent slopes.[1] | Severe: seasonal high water table. | Moderate: seasonal high water table. | Moderate: seasonal high water table; 0 to 8 percent slopes. | Severe: seasonal high water table. |
| CoC2 | Severe: seasonal high water table; slow permeability. | Severe: 8 to 15 percent slopes. | Severe: seasonal high water table. | Moderate: seasonal high water table; 8 to 15 percent slopes. | Severe: 8 to 15 percent slopes. | Severe: seasonal high water table. |
| Clymer channery loam: CrB. | Slight to moderate: 3½ to 6 feet depth to bedrock.[4] | Severe: moderately rapid permeability. | Slight to moderate: 3½ to 6 feet depth to bedrock.[4] | Slight | Slight to moderate: 3½ to 6 feet depth to bedrock; 0 to 10 percent slopes.[1 4] | Moderate: 3½ to 6 feet depth to bedrock. |

TABLE 7.—*Soil limitations for town and country planning*—Continued

| Soils and map symbols | Sewage disposal | | Homesites (buildings three stories or less) | | Streets and parking lots | Land fill and cemeteries |
|---|---|---|---|---|---|---|
| | Filter fields | Lagoons | With basements | Without basements | | |
| Cookport channery loam: | | | | | | |
| CtB | Severe: moderately slow to slow permeability; 2½ to 4 feet depth to bedrock. | Moderate: 2½ to 4 feet depth to bedrock; 0 to 8 percent slopes. | Moderate: seasonal moderately high water table; 2½ to 4 feet depth to bedrock. | Slight | Moderate: seasonal moderately high water table; 2½ to 4 feet depth to bedrock; 0 to 8 percent slopes. | Severe: seasonal moderately high water table; 2½ to 4 feet depth to bedrock. |
| CtC2 | Severe: moderately slow to slow permeability; 2½ to 4 feet depth to bedrock. | Severe: 8 to 15 percent slopes. | Moderate: seasonal moderately high water table; 2½ to 4 feet depth to bedrock; 8 to 15 percent slopes. | Moderate: 8 to 15 percent slopes. | Severe: 8 to 15 percent slopes. | Severe: seasonal moderately high water table; 2½ to 4 feet depth to bedrock. |
| Cookport and Ernest very stony loams: [5] | | | | | | |
| CuB | Severe: moderately slow to slow permeability; 2½+ feet depth to bedrock. | Slight to moderate: 2½ feet depth to bedrock; 0 to 8 percent slopes.[1] | Moderate: seasonal moderately high water table; 2½+ feet depth to bedrock; very stony. | Moderate: very stony. | Moderate: seasonal moderately high water table; 2½+ feet depth to bedrock; 0 to 8 percent slopes. | Severe: seasonal moderately high water table; 2½+ feet depth to bedrock; very stony. |
| CuD | Severe: moderately slow to slow permeability; 2½+ feet depth to bedrock; 8 to 25 percent slopes. | Severe: 8 to 25 percent slopes. | Moderate to severe: seasonal moderately high water table; 2½+ feet depth to bedrock; very stony; 8 to 25 percent slopes.[3] | Moderate to severe: very stony; 8 to 25 percent slopes.[3] | Severe: 8 to 25 percent slopes. | Severe: seasonal moderately high water table; 2½+ feet depth to bedrock; very stony; 8 to 25 percent slopes. |
| Cut and fill land: Cv. No interpretations. Properties too variable. | | | | | | |
| Dekalb channery loam: | | | | | | |
| DbB | Severe: 1½ to 3½ feet depth to bedrock. | Severe: moderately rapid to rapid permeability; 1½ to 3½ feet depth to bedrock. | Moderate: 1½ to 3½ feet depth to bedrock. | Slight | Moderate: 1½ to 3½ feet depth to bedrock; 0 to 10 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock. |
| DbC2 | Severe: 1½ to 3½ feet depth to bedrock; 10 to 20 percent slopes. | Severe: moderately rapid to rapid permeability; 1½ to 3½ feet depth to bedrock; 10 to 20 percent slopes. | Moderate to severe: 1½ to 3½ feet depth to bedrock; 10 to 20 percent slopes.[3] | Moderate to severe: 10 to 20 percent slopes.[3] | Severe: 10 to 20 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock; 10 to 20 percent slopes. |

See footnotes at end of table.

TABLE 7.—*Soil limitations for town and country planning*—Continued

| Soils and map symbols | Sewage disposal | | Homesites (buildings three stories or less) | | Streets and parking lots | Land fill and cemeteries |
|---|---|---|---|---|---|---|
| | Filter fields | Lagoons | With basements | Without basements | | |
| DbD2 | Severe: 1½ to 3½ feet depth to bedrock; 20 to 35 percent slopes. | Severe: moderately rapid to rapid permeability; 1½ to 3½ feet depth to bedrock; 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock; 20 to 35 percent slopes. |
| Dekalb-Calvin-Lehew very stony loams: | | | | | | |
| DcC | Severe: 1½ to 3½ feet depth to bedrock. | Severe: moderately rapid to rapid permeability; 1½ to 3½ feet depth to bedrock; 0 to 15 percent slopes. | Moderate: 1½ to 3½ feet depth to bedrock; 0 to 15 percent slopes; very stony. | Moderate: 0 to 15 percent slopes; very stony. | Moderate to severe: 1½ to 3½ feet depth to bedrock; 0 to 15 percent slopes.[1] | Severe: 1½ to 3½ feet depth to bedrock; very stony. |
| DcD | Severe: 1½ to 3½ feet depth to bedrock; 15 to 25 percent slopes. | Severe: moderately rapid to rapid permeability; 1½ to 3½ feet depth to bedrock; 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock; very stony; 15 to 25 percent slopes. |
| Dekalb and Gilpin very stony loams: | | | | | | |
| DgC | Severe: 1½ to 3½ feet depth to bedrock. | Severe: moderately rapid to rapid permeability; 1½ to 3½ feet depth to bedrock; 0 to 15 percent slopes. | Moderate: 1½ to 3½ feet depth to bedrock; 0 to 15 percent slopes; very stony. | Moderate: 0 to 15 percent slopes; very stony. | Moderate to severe: 1½ to 3½ feet depth to bedrock; 0 to 15 percent slopes.[1] | Severe: 1½ to 3½ feet depth to bedrock; very stony. |
| DgD | Severe: 1½ to 3½ feet depth to bedrock; 15 to 25 percent slopes. | Severe: moderately rapid to rapid permeability; 1½ to 3½ feet depth to bedrock; 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock; very stony; 15 to 25 percent slopes. |
| Dekalb and Leetonia very stony sandy loams: | | | | | | |
| DlC | Severe: 1½ to 3½ feet depth to bedrock. | Severe: moderately rapid to rapid permeability; 1½ to 3½ feet depth to bedrock; 0 to 15 percent slopes. | Moderate: 1½ to 3½ feet depth to bedrock; 0 to 15 percent slopes; very stony. | Moderate: 0 to 15 percent slopes; very stony. | Moderate to severe: 1½ to 3½ feet depth to bedrock; 0 to 15 percent slopes.[1] | Severe: 1½ to 3½ feet depth to bedrock; very stony. |
| DlD | Severe: 1½ to 3½ feet depth to bedrock; 15 to 25 percent slopes. | Severe: moderately rapid to rapid permeability; 1½ to 3½ feet depth to bedrock; 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock; very stony; 15 to 25 percent slopes. |

See footnotes at end of table.

TABLE 7.—*Soil limitations for town and country planning*—Continued

| Soils and map symbols | Sewage disposal | | Homesites (buildings three stories or less) | | Streets and parking lots | Land fill and cemeteries |
|---|---|---|---|---|---|---|
| | Filter fields | Lagoons | With basements | Without basements | | |
| Elkins silt loam: Ek | Severe: high water table; slow permeability; flood hazard.[2] | Severe: flood hazard.[2] | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard.[2] |
| Ernest silt loam: | | | | | | |
| ErA | Severe: moderately slow permeability. | Slight | Moderate: seasonal moderately high water table. | Slight | Moderate: seasonal moderately high water table. | Severe: seasonal moderately high water table. |
| ErB | Severe: moderately slow permeability. | Moderate: 3 to 8 percent slopes. | Moderate: seasonal moderately high water table. | Slight | Moderate: seasonal moderately high water table; 3 to 8 percent slopes. | Severe: seasonal moderately high water table. |
| ErC2 | Severe: moderately slow permeability. | Severe: 8 to 15 percent slopes. | Moderate: seasonal moderately high water table; 8 to 15 percent slopes. | Moderate: 8 to 15 percent slopes. | Severe: 8 to 15 percent slopes. | Severe: seasonal moderately high water table. |
| ErD2 | Severe: moderately slow permeability; 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: seasonal moderately high water table; 15 to 25 percent slopes. |
| Gilpin channery silt loam: | | | | | | |
| GnB2 | Severe: 1½ to 3½ feet depth to bedrock. | Severe: 1½ to 3½ feet depth to bedrock. | Moderate: 1½ to 3½ feet depth to bedrock. | Slight | Moderate: 1½ to 3½ feet depth to bedrock; 0 to 10 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock. |
| GnC2 | Severe: 1½ to 3½ feet depth to bedrock; 10 to 20 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock; 10 to 20 percent slopes. | Moderate to severe: 1½ to 3½ feet depth to bedrock; 10 to 20 percent slopes. | Moderate to severe: 10 to 20 percent slopes.[3] | Severe: 10 to 20 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock; 10 to 20 percent slopes. |
| GnD2, GnD3 | Severe: 1½ to 3½ feet depth to bedrock; 20 to 35 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock; 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock; 20 to 35 percent slopes. |
| Laidig very stony loam: | | | | | | |
| LaB | Severe: moderately slow permeability. | Slight to moderate: 0 to 8 percent slopes.[3] | Moderate: very stony. | Moderate: very stony. | Slight to moderate: 0 to 8 percent slopes.[1] | Severe: very stony. |
| LaD | Severe: moderately slow permeability; 8 to 25 percent slopes. | Severe: 8 to 25 percent slopes. | Moderate to severe: 8 to 25 percent slopes; very stony.[3] | Moderate to severe: 8 to 25 percent slopes; very stony.[3] | Severe: 8 to 25 percent slopes. | Severe: 8 to 25 percent slopes; very stony. |
| Lickdale silt loam: Lc, Ls. | Severe: high water table; slow permeability. | Slight | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table (Ls is also very stony). |

See footnotes at end of table.

TABLE 7.—*Soil limitations for town and country planning*—Continued

| Soils and map symbols | Sewage disposal | | Homesites (buildings three stories or less) | | Streets and parking lots | Land fill and cemeteries |
|---|---|---|---|---|---|---|
| | Filter fields | Lagoons | With basements | Without basements | | |
| Meckesville silt loam: McB | Severe: moderately slow permeability. | Slight to moderate: 0 to 8 percent slopes.[1] | Slight | Slight | Slight to moderate: 0 to 8 percent slopes.[1] | Slight. |
| McC2 | Severe: moderately slow permeability. | Severe: 8 to 15 percent slopes. | Moderate: 8 to 15 percent slopes. | Moderate: 8 to 15 percent slopes. | Severe: 8 to 15 percent slopes. | Moderate: 8 to 15 percent slopes. |
| Meckesville very stony silt loam: MdB | Severe: moderately slow permeability. | Slight to moderate: 0 to 8 percent slopes.[1] | Moderate: very stony. | Moderate: very stony. | Slight to moderate: 0 to 8 percent slopes.[1] | Severe: very stony. |
| MdD | Severe: moderately slow permeability; 8 to 25 percent slopes. | Severe: 8 to 25 percent slopes. | Moderate to severe: very stony; 8 to 25 percent slopes.[3] | Moderate to severe: very stony; 8 to 25 percent slopes.[3] | Severe: 8 to 25 percent slopes. | Severe: very stony; 8 to 25 percent slopes. |
| Noo silt loam: NoB | Severe: high water table; slow permeability. | Slight to moderate: 0 to 8 percent slopes.[1] | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. |
| Peat: Pe | Severe: high water table; ponding.[2] | Severe: too highly organic.[2] | Severe: high water table; ponding; lack of stability; subsidence. | Severe: high water table; ponding; lack of stability; subsidence. | Severe: high water table; ponding; lack of stability; subsidence. | Severe: high water table; ponding; lack of stability; subsidence.[2] |
| Philo silt loam: Ph | Severe: moderately slow permeability; flood hazard.[2] | Severe: flood hazard.[2] | Severe: flood hazard. | Severe: flood hazard. | Severe: flood hazard. | Severe: seasonal moderately high water table; flood hazard.[2] |
| Pope silt loam: Ps | Severe: flood hazard.[2] | Severe: flood hazard.[2] | Severe: flood hazard. | Severe: flood hazard. | Severe: flood hazard. | Severe: flood hazard.[2] |
| Purdy silt loam: PuC2 | Severe: high water table; slow permeability.[2] | Slight to severe: 0 to 15 percent slopes.[1 2] | Severe: high water table. | Severe: high water table. | Severe: high water table; 0 to 15 percent slopes. | Severe: high water table.[2] |
| Stony land: SrF | Severe: 1 to 3 feet depth to bedrock; 25 to 100 percent slopes. | Severe: 1 to 3 feet depth to bedrock; 25 to 100 percent slopes. | Severe: 25 to 100 percent slopes. | Severe: 25 to 100 percent slopes. | Severe: 25 to 100 percent slopes. | Severe: 1 to 3 feet depth to bedrock; very stony; 25 to 100 percent slopes. |
| Strip mines and dumps: St. No interpretations. Properties too variable. | | | | | | |
| Swamp: Sw. No interpretations. Properties too variable. | | | | | | |

See footnotes at end of table.

TABLE 7.—*Soil limitations for town and country planning*—Continued

| Soils and map symbols | Sewage disposal | | Homesites (buildings three stories or less) | | Streets and parking lots | Land fill and cemeteries |
|---|---|---|---|---|---|---|
| | Filter fields | Lagoons | With basements | Without basements | | |
| Ungers, Calvin and Lehew channery loams: UcB. | Severe: 2 to 3½ feet depth to bedrock. | Severe: 2 to 3½ feet depth to bedrock. | Moderate: 2 to 3½ feet depth to bedrock. | Slight | Moderate: 2 to 3½ feet depth to bedrock; 0 to 10 percent slopes. | Severe: 2 to 3½ feet depth to bedrock. |
| Ungers-Gilpin-Calvin channery loams: UnB. | Severe: 1½ to 3½ feet depth to bedrock. | Severe: 1½ to 3½ feet depth to bedrock. | Moderate: 1½ to 3½ feet depth to bedrock. | Slight | Moderate: 1½ to 3½ feet depth to bedrock; 0 to 10 percent slopes. | Severe: 1½ to 3½ feet depth to bedrock. |
| Very stony land: VsD, VsF | Severe: 0 to 2 feet depth to bedrock; extremely stony; 0 to 100+ percent slopes. | Severe: 0 to 2 feet depth to bedrock; extremely stony; 0 to 100+ percent slopes. | Severe: 0 to 2 feet depth to bedrock; extremely stony; 0 to 100+ percent slopes. | Severe: 0 to 2 feet depth to bedrock; extremely stony; 0 to 100+ percent slopes. | Severe: 0 to 2 feet depth to bedrock; extremely stony; 0 to 100+ percent slopes. | Severe: 0 to 2 feet depth to bedrock; extremely stony; 0 to 100+ percent slopes. |
| Wharton silt loam: WhB2 | Severe: slow permeability. | Slight to moderate: 0 to 10 percent slopes.[1] | Moderate: seasonal moderately high water table. | Slight | Moderate: seasonal moderately high water table; 0 to 10 percent slopes. | Severe: seasonal moderately high water table. |
| WhC2 | Severe: slow permeability; 10 to 20 percent slopes. | Severe: 10 to 20 percent slopes. | Moderate to severe: seasonal moderately high water table; 10 to 20 percent slopes.[3] | Moderate to severe: 10 to 20 percent slopes.[3] | Severe: 10 to 20 percent slopes. | Severe: seasonal moderately high water table; 10 to 20 percent slopes. |

[1] Slope limitations for sewage lagoons and for streets and parking lots are slight up to 3 percent, moderate from 3 to 10 percent, and severe on slopes of more than 10 percent.

[2] Soils of the Allegheny, Atkins, Elkins, Philo, Pope, and Purdy series, as well as areas of Alluvial land, are on flood plains or terraces of streams and rivers where effluent from septic filter fields, sewage lagoons, and landfill could readily become a source of pollution to waterways. This potential is greatest, of course, on soils of flood plains that are more frequently flooded than are soils of terraces. Other soils may be incidentally adjacent to water, but are not characteristically so, and this pollution hazard cannot be specifically assigned to them.

[3] Slope limitations for homesites are slight up to 8 percent, moderate from 8 to 15 percent, and severe on slopes of more than 15 percent.

[4] Limitation is slight where depth to bedrock is 5 feet or more and moderate where depth is less than 5 feet.

[5] Cookport soils may be as shallow as 2½ feet to bedrock, but Ernest soils are deeper. This difference does not affect the degree of limitation for either soil.

TABLE 8.—*Soil limitations for specified recreational uses*

| Soil types and map symbols | Lawns, fairways, landscaping | Camp areas | Playgrounds | Picnic areas | Paths and trails |
|---|---|---|---|---|---|
| Albrights silt loam: AbB | Slight | Moderate: seasonal moderately high water table; moderately slow permeability. | Moderate: seasonal moderately high water table; moderately slow permeability; 0 to 8 percent slopes. | Moderate: seasonal moderately high water table. | Slight. |
| AbC2 | Moderate: 8 to 15 percent slopes. | Moderate: seasonal moderately high water table; moderately slow permeability; 8 to 15 percent slopes. | Severe: 8 to 15 percent slopes. | Moderate: seasonal moderately high water table; 8 to 15 percent slopes. | Slight |
| Albrights very stony silt loam: AgC. | Moderate: very stony; 0 to 15 percent slopes. | Moderate: seasonal moderately high water table; moderately slow permeability; very stony; 0 to 15 percent slopes. | Moderate to severe: seasonal moderately high water table; moderately slow permeability; very stony; 0 to 15 percent slopes.[1] | Moderate: seasonal moderately high water table; 0 to 15 percent slopes. | Moderate: very stony. |
| Allegheny fine sandy loam: AhB. | Slight | Slight | Slight to moderate: 0 to 8 percent slopes.[1] | Slight | Slight. |
| Alluvial land: An, Ao | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. |
| Armagh silt loam: Ar | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. |
| Atkins silt loam: At | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. |
| Brinkerton and Andover silt loams:[2] BrA, BrB. | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. |
| Brinkerton and Andover very stony silt loams: BsC. | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. |
| Calvin-Gilpin-Ungers channery loams: CaC2 | Moderate to severe: 1½ to 3½ feet depth to bedrock; 10 to 20 percent slopes.[3] | Moderate to severe: 10 to 20 percent slopes.[3] | Severe: 10 to 20 percent slopes. | Moderate to severe: coarse fragments; 10 to 20 percent slopes.[3] | Moderate: coarse fragments; 10 to 20 percent slopes. |
| CaD2, CaD3 | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Moderate to severe: coarse fragments; 20 to 35 percent slopes.[4] |
| Calvin and Lehew channery loams: CIE | Severe: 35 to 50 percent slopes. | Severe: 35 to 50 percent slopes. | Severe: 35 to 50 percent slopes. | Severe: 35 to 50 percent slopes. | Severe: 35 to 50 percent slopes. |

See footnotes at end of table.

TABLE 8.—*Soil limitations for specified recreational uses*—Continued

| Soil types and map symbols | Lawns, fairways, landscaping | Camp areas | Playgrounds | Picnic areas | Paths and trails |
|---|---|---|---|---|---|
| Calvin, Ungers and Lehew channery loams: | | | | | |
| CnC2 | Moderate to severe: 2 to 3½ feet depth to bedrock; 10 to 20 percent slopes.[3] | Moderate to severe: 10 to 20 percent slopes.[3] | Severe: 10 to 20 percent slopes. | Moderate to severe: coarse fragments; 10 to 20 percent slopes.[3] | Moderate: coarse fragments; 10 to 20 percent slopes. |
| CnD2, CnD3 | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Moderate to severe: coarse fragments; 20 to 35 percent slopes.[4] |
| Cavode silt loam: | | | | | |
| CoB | Moderate: seasonal high water table. | Moderate: seasonal high water table; slow permeability. | Moderate: seasonal high water table; slow permeability; 0 to 8 percent slopes. | Moderate: seasonal high water table. | Moderate: seasonal high water table. |
| CoC2 | Moderate: seasonal high water table; 8 to 15 percent slopes. | Moderate: seasonal high water table; slow permeability; 8 to 15 percent slopes. | Severe: 8 to 15 percent slopes. | Moderate: seasonal high water table; 8 to 15 percent slopes. | Moderate: seasonal high water table. |
| Clymer channery loam: CrB | Slight | Slight | Moderate: coarse fragments; 0 to 8 percent slopes. | Moderate: coarse fragments. | Moderate: coarse fragments. |
| Cookport channery loam: | | | | | |
| CtB | Moderate: 2½ to 4 feet depth to bedrock. | Moderate: seasonal moderately high water table; moderately slow to slow permeability. | Moderate: seasonal moderately high water table; moderately slow to slow permeability; 2½ to 4 feet depth to bedrock; coarse fragments; 0 to 8 percent slopes. | Moderate: seasonal moderately high water table; coarse fragments. | Moderate: coarse fragments. |
| CtC2 | Moderate: 2½ to 4 feet depth to bedrock; 8 to 15 percent slopes. | Moderate: seasonal moderately high water table; moderately slow to slow permeability; 8 to 15 percent slopes. | Severe: 8 to 15 percent slopes. | Moderate: seasonal moderately high water table; coarse fragments; 8 to 15 percent slopes. | Moderate: coarse fragments. |
| Cookport and Ernest very stony silt loams:[5] | | | | | |
| CuB | Moderate: 2½+ feet depth to bedrock; very stony. | Moderate: seasonal moderately high water table; moderately slow to slow permeability; very stony. | Moderate: seasonal moderately high water table; moderately slow to slow permeability; 2½+ feet depth to bedrock; very stony; 0 to 8 percent slopes. | Moderate: seasonal moderately high water table. | Moderate: very stony. |
| CuD | Moderate to severe: 2½+ feet depth to bedrock; very stony; 8 to 25 percent slopes.[3] | Moderate to severe: seasonal moderately high water table; moderately slow to slow permeability; very stony; 8 to 25 percent slopes.[3] | Severe: 8 to 25 percent slopes. | Moderate to severe: seasonal moderately high water table; 8 to 25 percent slopes.[3] | Moderate: very stony; 8 to 25 percent slopes. |

See footnotes at end of table.

TABLE 8.—*Soil limitations for specified recreational uses*—Continued

| Soil types and map symbols | Lawns, fairways, landscaping | Camp areas | Playgrounds | Picnic areas | Paths and trails |
|---|---|---|---|---|---|
| Cut and fill land: Cv. No interpretations. Properties too variable. | | | | | |
| Dekalb channery loams: DbB | Moderate: 1½ to 3½ feet depth to bedrock. | Slight | Moderate: 1½ to 3½ feet depth to bedrock; coarse fragments; 0 to 10 percent slopes. | Moderate: coarse fragments. | Moderate: coarse fragments. |
| DbC2 | Moderate to severe: 1½ to 3½ feet depth to bedrock; 10 to 20 percent slopes.[3] | Moderate to severe: 10 to 20 percent slopes.[3] | Severe: 10 to 20 percent slopes. | Moderate to severe: coarse fragments; 10 to 20 percent slopes.[3] | Moderate: coarse fragments; 10 to 20 percent slopes. |
| DbD2 | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Moderate to severe: coarse fragments; 20 to 35 percent slopes.[4] |
| Dekalb-Calvin-Lehew very stony loams: DcC | Moderate: 1½ to 3½ feet depth to bedrock; very stony; 0 to 15 percent slopes. | Moderate: very stony; 0 to 15 percent slopes. | Moderate to severe: 1½ to 3½ feet depth to bedrock; very stony; 0 to 15 percent slopes.[1] | Slight to moderate: 0 to 15 percent slopes.[3] | Moderate: very stony. |
| DcD | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Moderate: very stony; 15 to 25 percent slopes. |
| Dekalb and Gilpin very stony loams: DgC | Moderate : 1½ to 3½ feet depth to bedrock; very stony; 0 to 15 percent slopes. | Moderate: very stony; 0 to 15 percent slopes. | Moderate to severe: 1½ to 3½ feet depth to bedrock; very stony; 0 to 15 percent slopes.[3] | Slight to moderate: 0 to 15 percent slopes.[3] | Moderate: very stony. |
| DgD | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Moderate: very stony; 15 to 25 percent slopes. |
| D ekalb and Leetonia very stony sandy loams: DlC | Moderate: 1½ to 3½ feet depth to bedrock; sandy surface; very stony; 0 to 15 percent slopes. | Moderate: very stony; 0 to 15 percent slopes. | Moderate to severe: 1½ to 3½ feet depth to bedrock; very stony; 0 to 15 percent slopes.[3] | Slight to moderate: 0 to 15 percent slopes.[3] | Moderate: very stony. |
| DlD | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Moderate: very stony; 15 to 25 percent slopes. |
| Elkins silt loam: Ek | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. | Severe: high water table; flood hazard. |

See footnotes at end of table.

TABLE 8.—*Soil limitations for specified recreational uses*—Continued

| Soil types and map symbols | Lawns, fairways, landscaping | Camp areas | Playgrounds | Picnic areas | Paths and trails |
|---|---|---|---|---|---|
| Ernest silt loam: | | | | | |
| ErA | Slight | Moderate: seasonal moderately high water table; moderately slow permeability. | Moderate: seasonal moderately high water table; moderately slow permeability. | Moderate: seasonal moderately high water table. | Slight. |
| ErB | Slight | Moderate: seasonal moderately high water table; moderately slow permeability. | Moderate: seasonal moderately high water table; moderately slow permeability; 3 to 8 percent slopes. | Moderate: seasonal moderately high water table. | Slight. |
| ErC2 | Moderate: 8 to 15 percent slopes. | Moderate: seasonal moderately high water table; moderately slow permeability; 8 to 15 percent slopes. | Severe: 8 to 15 percent slopes. | Moderate: seasonal moderately high water table; 8 to 15 percent slopes. | Slight. |
| ErD2 | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Severe: 15 to 25 percent slopes. | Moderate: 15 to 25 percent slopes. |
| Gilpin channery silt loam: | | | | | |
| GnB2 | Moderate: 1½ to 3½ feet depth to bedrock. | Slight | Moderate: 1½ to 3½ feet depth to bedrock; coarse fragments; 0 to 10 percent slopes. | Moderate: coarse fragments. | Moderate: coarse fragments. |
| GnC2 | Moderate to severe: 1½ to 3½ feet depth to bedrock; 10 to 20 percent slopes.[3] | Moderate to severe: 10 to 20 percent slopes.[3] | Severe: 10 to 20 percent slopes. | Moderate to severe: coarse fragments; 10 to 20 percent slopes.[3] | Moderate: coarse fragments; 10 to 20 percent slopes. |
| GnD2, GnD3 | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Severe: 20 to 35 percent slopes. | Moderate to severe: coarse fragments; 20 to 35 percent slopes.[4] |
| Laidig very stony loam: | | | | | |
| LaB | Moderate: very stony. | Moderate: moderately slow permeability; very stony. | Moderate: moderately slow permeability; very stony; 0 to 8 percent slopes. | Slight | Moderate: very stony. |
| LaD | Moderate to severe: very stony; 8 to 25 percent slopes.[3] | Moderate to severe: moderately slow permeability; very stony; 8 to 25 percent slopes.[3] | Severe: 8 to 25 percent slopes. | Moderate to severe: 8 to 25 percent slopes.[3] | Moderate: very stony; 8 to 25 percent slopes. |
| Lickdale very stony silt loam: Lc, Ls. | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. |
| Meckesville silt loam: | | | | | |
| McB | Slight | Moderate: moderately slow permeability. | Moderate: moderately slow permeability; 0 to 8 percent slopes. | Slight | Slight. |
| McC2 | Moderate: 8 to 15 percent slopes. | Moderate: moderately slow permeability; 8 to 15 percent slopes. | Severe: 8 to 15 percent slopes. | Moderate: 8 to 15 percent slopes. | Slight. |

See footnotes at end of table.

TABLE 8.—*Soil limitations for specified recreational uses*—Continued

| Soil types and map symbols | Lawns, fairways, landscaping | Camp areas | Playgrounds | Picnic areas | Paths and trails |
|---|---|---|---|---|---|
| Meckesville very stony silt loam: MdB | Moderate: very stony. | Moderate: moderately slow permeability; very stony. | Moderate: moderately slow permeability; very stony; 0 to 8 percent slopes. | Slight | Moderate: very stony. |
| MdD | Moderate to severe: very stony; 8 to 25 percent slopes.[3] | Moderate to severe: moderately slow permeability; very stony; 8 to 25 percent slopes.[3] | Severe: 8 to 25 percent slopes. | Moderate to severe: 8 to 25 percent slopes.[3] | Moderate: very stony; 8 to 25 percent slopes. |
| Nolo silt loam NoB | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. |
| Peat: Pe | Severe: high water table; ponding; lack of stability; subsidence. | Severe: high water table; ponding; lack of stability; subsidence. | Severe: high water table; ponding; lack of stability; subsidence. | Severe: high water table; ponding; lack of stability. | Severe: high water table; ponding; lack of stability. |
| Philo silt loam: Ph | Severe: flood hazard. | Severe: flood hazard. | Moderate: seasonal moderately high water table; flood hazard. | Moderate: seasonal moderately high water table; flood hazard. | Moderate: flood hazard. |
| Pope silt loam: Ps | Moderate: flood hazard. | Severe: flood hazard. | Moderate: flood hazard. | Moderate: flood hazard. | Slight to moderate: flood hazard. |
| Purdy silt loam: PuC2 | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. | Severe: high water table. |
| Stony land: SrF | Severe: 25 to 100 percent slopes. | Severe: 25 to 100 percent slopes. | Severe: 25 to 100 percent slopes. | Severe: 25 to 100 percent slopes. | Severe: 25 to 100 percent slopes. |
| Strip mines and dumps: St. No interpretations. Properties too variable. | | | | | |
| Swamp: Sw. No interpretations. Properties too variable. | | | | | |
| Ungers, Calvin and Lehew channery loams: UcB. | Moderate: 2 to 3½ feet depth to bedrock. | Slight | Moderate: 2 to 3½ feet depth to bedrock; coarse fragments; 0 to 10 percent slopes. | Moderate: coarse fragments. | Moderate: coarse fragments. |
| Ungers-Gilpin-Calvin channery loams: UnB. | Moderate: 1½ to 3½ feet depth to bedrock. | Slight | Moderate: 1½ to 3½ feet depth to bedrock; coarse fragments; 0 to 10 percent slopes. | Moderate: coarse fragments. | Moderate: coarse fragments. |

See footnotes at end of table.

TABLE 8.—*Soil limitations for specified recreational uses*—Continued

| Soil types and map symbols | Lawns, fairways, landscaping | Camp areas | Playgrounds | Picnic areas | Paths and trails |
|---|---|---|---|---|---|
| Very stony land: | | | | | |
| VsD | Severe: extremely stony; 0 to 25 percent slopes. | Severe: extremely stony; 0 to 25 percent slopes. | Severe: extremely stony; 0 to 25 percent slopes. | Moderate to severe: extremely stony; 0 to 25 percent slopes.[3] | Severe: extremely stony. |
| VsF | Severe: extremely stony; 25 to 100+ percent slopes. | Severe: extremely stony; 25 to 100+ percent slopes. | Severe: extremely stony; 25 to 100+ percent slopes. | Severe: 25 to 100+ percent slopes. | Severe: extremely stony; 25 to 100+ percent slopes. |
| Wharton silt loam: | | | | | |
| WhB2 | Slight | Moderate: seasonal moderately high water table; slow permeability. | Moderate: seasonal moderately high water table; slow permeability; 0 to 10 percent slopes. | Moderate: seasonal moderately high water table. | Slight. |
| WhC2 | Moderate to severe: 10 to 20 percent slopes.[3] | Moderate to severe: seasonal moderately high water table; slow permeability; 10 to 20 percent slopes.[3] | Severe: 10 to 20 percent slopes. | Moderate to severe: seasonal moderately high water table; 10 to 20 percent slopes.[3] | Slight to moderate: 10 to 20 percent slopes.[4] |

[1] Slope limitations for playgrounds are slight up to 3 percent, moderate from 3 to 10 percent, and severe on slopes of more than 10 percent.

[2] Brinkerton and Andover very stony silt loams, 0 to 15 percent slopes (BsC) is also severely limited for use as playgrounds where the slope is more than 10 percent.

[3] Slope limitations for lawns, fairways, and landscaping, for camp areas, and for picnic areas, are slight up to 8 percent, moderate from 8 to 15 percent, and severe on slopes of more than 15 percent.

[4] Slope limitations for paths and trails are slight up to 15 percent, moderate from 15 to 25 percent, and severe on slopes of more than 25 percent.

[5] Cookport soils may be as shallow as 2½ feet to bedrock, but Ernest soils are deeper. This difference does not affect the degree of limitation for either soil.

# *Formation and Classification of the Soils*

This section consists of three parts. In the first part the factors of soil formation are discussed as they relate to the soils of Garrett County. The second part explains the morphology of the soils. In the third part each soil series in the county is placed in its respective family, subgroup, and order of the current system for classifying soils and also in the appropriate great soil group of the classification system established in 1938.

## Factors of Soil Formation

Soils are the products of soil-forming processes acting upon materials deposited or altered by geologic forces. The five major factors in the formation of soils are climate, living organisms, parent material, relief, and time. Climate and living organisms, particularly vegetation, are the active forces. Their effect on parent material is modified by relief and by the length of time the parent material has been in place. The relative importance of each factor varies from place to place. In some places one factor is dominant and fixes most of the properties of the soil. Normally, however, the interaction of all five factors determines the kind of soil that develops in any given place.

### *Climate*

Climate is important in the formation of soils because it influences the weathering of rocks and minerals. Weathering is more rapid under a warm, humid climate than it is under a cold or dry climate. Precipitation and the length of the growing season influence the type and abundance of vegetation. Precipitation also affects the translocation and leaching of some products of weathering. Hard rains and frequent showers can cause excessive erosion of surface soil, as does also the rapid melting of snow and ice.

Garrett County has a humid, temperate, continental climate. The climate is fairly uniform throughout the county, although there are local differences in weather at different elevations. There are no significant differences among soils of the county caused by climate alone. All the soils are strongly weathered, and are leached, acid, and relatively low in plant nutrient content.

### *Living organisms*

Native plants have been a major influence on the development of soils. In Garrett County the native vegetation consisted mostly of hardwood forests but included conifers in places.

Most hardwoods use large amounts of calcium and other bases if these elements are available. Hardwood

trees and other plants take up minerals from the soil and store them in their roots, stems, and leaves. When deciduous trees shed their leaves or when plants die and decay, the plant nutrients are returned to the soil and are used by other plants. If undisturbed, this cycle is continuous.

Soil development is also affected by plant roots, for these penetrate soil material to various depths, generally increase soil porosity, and break coarse fragments such as stones and even the surface of the bedrock. Organic acids produced by plants and their decay react on basic minerals contained in the parent material. Minerals taken into solution or suspension are absorbed by plants, or translocated within the soil, or leached entirely out of the soil.

Rodents, worms, insects, and other burrowing animals have contributed to soil formation. Except for man, however, there is little evidence that any animal has caused important differences in soils of the county. Man has cleared forests, introduced new plants, and drained and cultivated soils. Use by man has accelerated loss of soil through erosion, which has thinned or otherwise changed some soils. Material washed from uplands has been deposited in depressions and on flood plains where it has become the parent material of certain young or immature soils.

### *Parent material*

The soils of Garrett County formed in two general kinds of parent material. By far the most extensive is residuum accumulated by the weathering of rocks in place. The other is fine material and rock fragments transported and deposited mainly by water or by gravity.

The residuum weathered from several kinds of rocks. The Clymer, Cookport, Dekalb, Leetonia, Lehew, Lickdale, and Nolo soils formed in residuum weathered primarily from sandstone. The Armagh, Brinkerton, Calvin, Cavode, Gilpin, Ungers, and Wharton soils formed in residuum from shale and siltstone, locally with some sandstone.

Transported materials are the parent material for the other soils of the county. On recent alluvium are the Atkins, Elkins, Philo, and Pope soils. On older alluvium are the Allegheny and Purdy soils. The Albrights, Andover, Ernest, Laidig, and Meckesville soils formed in acid colluvial materials. Recent local alluvium has influenced the surface horizon of a few soils. Accumulated organic material is the parent material for Peat.

### *Relief*

The soils of Garrett County range from nearly level to very steep. Differences in slope, especially in combination with differences in position on the landscape, have a significant influence on the kind of soil that develops from a given parent material. This influence can be illustrated by comparing different soils that developed mainly in residuum from hard, acid sandstone. The Dekalb and Leetonia soils are only moderately deep and are well drained. They developed in areas where slopes are mostly strongly sloping to steep, and most of them are very stony. The Cookport soils are less strongly sloping than the Dekalb soils and are only moderately well drained. The Nolo soils mostly are gently sloping and are poorly drained; the Lickdale soils are nearly level and are very poorly drained.

### *Time*

The parent material of the soils in Garrett County ranges from very young to very old. The youngest is the alluvium deposited on flood plains during the present, or Holocene, geologic epoch. These deposits receive new material annually from floodwater. Material on terraces along some of the major streams is somewhat older. This material was laid down during the Pleistocene epoch. Colluvial deposits are mostly of the Pleistocene epoch or older. Weathered bedrock in which residual soils have developed is much older than Pleistocene.

Soils that formed in the same kind of parent material but in areas of different relief do not necessarily mature in the same length of time. In some steep areas, for example, only very weak horizons have had time to develop, partly because soil has been removed by natural erosion almost as rapidly as it has formed. In less sloping areas, on the same kind of parent material, there has been time for stronger horizonation of soils because of less loss by natural erosion.

Some of the alluvial material in the county has not been in place long enough for well-defined horizons to form. Areas of this material are classified simply as Alluvial land. The named soil series on flood plains have weakly developed horizons, mostly for the same reason.

## Morphology of the Soils

Most of the soils of the county have moderately or strongly differentiated horizons. Only weak horizonation is shown, however, in young soils on flood plains.

The formation of soil horizons is the result of one or more of the following processes: (1) accumulation of organic matter; (2) leaching of carbonates and other soluble compounds; (3) chemical weathering, chiefly by hydrolysis, of the primary minerals of parent materials into silicate clay minerals; (4) translocation of silicate clay minerals, and probably of some silt-sized particles, from one horizon to another; and (5) chemical changes of iron by oxidation, reduction, or hydration and subsequent downward movement of the iron particles in altered form.

In most of the soils of the county, several of these processes have been active in the development of horizons. For example, the interaction of the first, second, third, and fourth processes is reflected in the horizons of the Clymer soil, and all five processes have been active in the horizonation of the moderately well drained to somewhat poorly drained Albrights and Cavode soils. Only the first process has had any marked effect on the Pope soils. In some soils developed in transported and redeposited materials, the leaching of carbonates and other compounds may have taken place before the soil materials were redeposited, and some of the other processes may have been active before such deposition.

Some organic matter has accumulated in all soils to form an A1 horizon, but in many places this horizon has lost its identity as a result of tillage and is now part of an Ap horizon. The content of organic matter varies from soil to soil. The Lehew soils have a weak, thin A1 horizon

that contains little organic matter, but the Elkins and Lickdale soils have a prominent, thick A1 or Ap horizon that is high in organic-matter content.

There have been some studies made of the clay mineralogy of soils of this part of Maryland. Generally, the soils contain a mixture of clay minerals, but no particular mineral is dominant.

Translocation of clay minerals has contributed to the development of horizons in many of the soils. These minerals have been partly moved downward from the A horizons and partly immobilized in a Bt horizon. This is characteristic of the Albrights, Allegheny, Andover, Armagh, Brinkerton, Cavode, Clymer, Cookport, Ernest, Gilpin, Laidig, Meckesville, Nolo, Purdy, Ungers, and Wharton soils. These soils not only have a Bt horizon containing more clay than the A horizon but also have visible coatings of clay on surfaces of the structural elements of the Bt horizon. Translocation of clay may have taken place in other soils of the county, but if so, there is no visible evidence of accumulation below the A horizon.

Under certain conditions in soil materials that are coarse textured and very acid, organic matter is removed from near the surface and redeposited in the subsoil to form a Bh horizon, probably with some colloidal aluminum or iron compounds. This is characteristic of the Leetonia soil.

The reduction and transfer of iron has taken place to some degree in all soils that have impeded natural drainage. This process is most clearly evident in soils of the Andover, Armagh, Atkins, Brinkerton, Elkins, Lickdale, Nolo, and Purdy series.

Hydrated iron oxide is a product of weathering of minerals in many soils, and this oxide accounts for the reddish colors in some subsoils. The distinctly reddish colors in the Albrights, Calvin, Lehew, Meckesville, and Ungers soils, however, are mostly inherited from reddish geologic material, but the colors may have been augmented by iron oxide, particularly in the Ungers series.

## Classification of the Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories, so that information can be applied to large geographic areas.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and revised later (*4*). The system currently used by the National Cooperative Soil Survey was developed in the early sixties (*3*) and was adopted in 1965 (*6*). It is under continual study.

The current system of classification has six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are observable or measurable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 9 shows the classification of each soil series of Garrett County by family, subgroup, and order according to the current system and according to the great soil group of the 1938 system.

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that soils of similar mode of origin are grouped together. The classes that make up the current system are briefly defined in the following paragraphs.

ORDER: Ten soil orders are recognized. Each order is named with a word of three or four syllables ending in sol (Ult-i-sol). The ten orders are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, Entisols and Histosols, occur in many different climates.

Table 9 shows the six orders in Garrett County—Inceptisols, Entisols, Spodosols, Alfisols, Ultisols, and Histosols.

Inceptisols are mineral soils in which horizons have definitely begun to develop but are weakly expressed. They are on young but not necessarily recent land surfaces. Examples are the Lehew soils on uplands and the Pope soils on flood plains.

Entisols are mineral soils that have not been changed much from their parent geological materials. The only representative soils in Garrett County are those of the Atkins series.

Spodosols are mineral soils that have a subsoil that has been augmented in organic matter. The only representative soils in Garrett County are those of the Leetonia series.

Alfisols are soils containing a clay-enriched B horizon that is high in bases (base saturation greater than 35 percent). As a result, these soils have a better supply of basic plant nutrients than most other soils of the county. The only representatives in Garrett County are soils of the Albrights series.

Ultisols are mineral soils that have a clay-enriched B horizon in which base saturation is low, generally less than 35 percent. They generally represent the ultimate in soil development in that the processes have not been prevented or blocked by lack of weatherable minerals or by some unaccountable variation in the environment. In Garrett County, 15 of the 26 soil series are Ultisols.

Histosols are essentially non-mineral soils. They are composed mostly of organic materials, chiefly plant remains, and a relatively small content of mineral material. The only example in Garrett County is Peat.

SUBORDER: Each order is divided into suborders, primarily on the basis of those soil characteristics that seem to produce classes having the greatest genetic similarity. The suborders narrow the broad climatic range permitted

TABLE 9.—*Soil series classified according to the current system of classification and the 1938 system*

| Series | Current system | | | 1938 system |
|---|---|---|---|---|
| | Family | Subgroup | Order | Great soil group |
| Albrights | Fine-loamy, mixed, mesic | Aquic Fragiudalfs | Alfisols | (1). |
| Allegheny | Fine-loamy, mixed, mesic | Typic Hapludults | Ultisols | Gray-Brown Podzolic soils. |
| Andover | Fine-loamy, mixed, mesic | Typic Fragiaquults | Ultisols | Low-Humic Gley soils. |
| Armagh [2] [3] | Clayey, mixed, mesic | Typic Ochraquults | Ultisols | Low-Humic Gley soils. |
| Atkins | Fine-loamy, mixed, acid, mesic | Typic Fluvaquents | Entisols | Alluvial soils. |
| Brinkerton [3] | Fine-silty, mixed, mesic | Typic Fragiaquults | Ultisols | Low-Humic Gley soils. |
| Calvin [3] | Loamy-skeletal, mixed, mesic | Typic Dystrochrepts | Inceptisols | Lithosols. |
| Cavode [3] | Fine-loamy, mixed, mesic | Aeric Ochraquults | Ultisols | Red-Yellow Podzolic soils. |
| Clymer | Fine-loamy, mixed, mesic | Typic Hapludults | Ultisols | Gray-Brown Podzolic soils. |
| Cookport | Fine-loamy, mixed, mesic | Aquic Fragiudults | Ultisols | Gray-Brown Podzolic soils. |
| Dekalb | Loamy-skeletal, mixed, mesic | Typic Dystrochrepts | Inceptisols | Sols Bruns Acides. |
| Elkins | Fine-silty, mixed, acid, mesic | Humic Haplaquepts | Inceptisols | Humic Gley soils. |
| Ernest | Fine-loamy, mixed, mesic | Aquic Fragiudults | Ultisols | Red-Yellow Podzolic soils. |
| Gilpin | Fine-loamy, mixed, mesic | Typic Hapludults | Ultisols | Gray-Brown Podzolic soils. |
| Laidig | Fine-loamy, mixed, mesic | Typic Fragiudults | Ultisols | Red-Yellow Podzolic soils. |
| Leetonia | Sandy-skeletal, siliceous, mesic | Entic Haplorthods | Spodosols | Podzols. |
| Lehew | Loamy-skeletal, mixed, mesic | Typic Dystrochrepts | Inceptisols | Sols Bruns Acides. |
| Lickdale [3] | Fine-loamy, mixed, acid, mesic | Humic Haplaquepts | Inceptisols | Humic Gley soils. |
| Meckesville [3] | Fine-loamy, mixed, mesic | Typic Fragiudults | Ultisols | (1). |
| Nolo | Fine-loamy, mixed, mesic | Typic Fragiaquults | Ultisols | Planosols. |
| Peat [4] | | Medihemists | Histosols | Bog soils. |
| Philo | Coarse-loamy, mixed, mesic | Fluvaquentic Dystrochrepts | Inceptisols | Alluvial soils. |
| Pope | Coarse-loamy, mixed, mesic | Fluventic Dystrochrepts | Inceptisols | Alluvial soils. |
| Purdy | Clayey, mixed, mesic | Typic Ochraquults | Ultisols | Low-Humic Gley soils. |
| Ungers | Fine-loamy, mixed, mesic | Typic Hapludults | Ultisols | (1). |
| Wharton [3] | Clayey, mixed, mesic | Aquic Hapludults | Ultisols | Gray-Brown Podzolic soils. |

[1] Not classified.
[2] The Amagh soil in Garrett County is a taxadjunct to the Armagh series. The solum is less than 40 inches thick, unlike the solum in a modal pedon of the Armagh series which is more than 40 inches thick.
[3] Classification is provisional and subject to revision.
[4] Peat in Garrett County has not been given a series name and is only partly classified. It is a Medihemist, but the subgroup designation and the family have not been established.

in the orders. The soil properties used to separate suborders mainly reflect either the presence or absence of waterlogging or soil differences resulting from the climate or vegetation. The suborder is not shown in table 9.

GREAT GROUP: Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated. The features used are soil temperature, major differences in chemical composition (mainly basic minerals or compounds), and the like. The great group is not shown in table 9, but the name of the great group is the same as the last word in the name of the subgroup.

SUBGROUP: Great groups are divided into subgroups, one representing the central (typic) segment of the group, and others, called intergrades, that have major properties of one great group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside the range of any other great group, suborder, or order. The names of subgroups are devised by placing one or more adjectives before the name of the great group. An example is Typic Hapludult (a typical Hapludult); another is Aquic Hapludult (a Hapludult that is somewhat wetter than typical).

FAMILY: Families are separated within a subgroup primarily on the basis of properties important to plant growth or to soil behavior in engineering uses. Among properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives, and these are the class names for texture, mineralogy, and so on, that are used as family differentiae.

SERIES: The series consists of a group of soils that formed from a particular kind of parent material and have genetic horizons that, except for texture of the surface soil, are similar in differentiating characteristics and in arrangement in the profile. Among these characteristics are color, structure, reaction, consistence, and mineralogical and chemical composition.

## *Climate of Garrett County* [5]

Garrett County has a humid, continental climate by reason of its annual precipitation, which averages more than 45 inches, and its location in the middle latitudes where the general atmospheric flow is from west to east. This county generally records, on a yearly basis, the most precipitation, the heaviest snowfall, and the coldest temperatures of all Maryland's counties. The −40° F. temperature recorded at Oakland on January 13, 1912 is both Maryland's lowest and the lowest temperature recorded south of the Mason-Dixon line.

[5] By W. J. MOYER, climatologist for Maryland and Delaware, National Weather Service, U.S. Department of Commerce.

TABLE 10.—*Temperature and precipitation data*

[All data from Oakland, station coordinates 39°24′ N; 79°24′ W; elevation 2,420 feet. Period of record 1931–60]

| Month | Temperature | | | | Precipitation | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Average daily maximum | Average daily minimum | Two years in 10 will have at least 4 days with [1]— | | 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 of 1 inch or more |
| | | | Maximum temperature equal to or higher than | Minimum temperature equal to or lower than | | Less than— | More than— | | |
| | °F. | °F. | °F. | °F. | *Inches* | *Inches* | *Inches* | *Number* | *Inches* |
| January | 39.0 | 19.4 | 56 | 0 | 4.38 | 2.2 | 7.2 | 16 | 3 |
| February | 40.4 | 18.2 | 56 | 2 | 3.46 | 1.5 | 5.1 | 12 | 4 |
| March | 47.4 | 24.3 | 66 | 7 | 4.55 | 3.2 | 7.0 | 9 | 4 |
| April | 60.4 | 34.0 | 77 | 21 | 4.14 | 2.4 | 6.4 | 1 | 1 |
| May | 70.3 | 43.3 | 81 | 31 | 4.71 | 2.1 | 7.1 | 0 | 0 |
| June | 77.7 | 52.0 | 86 | 41 | 4.68 | 2.8 | 7.6 | 0 | 0 |
| July | 80.5 | 55.5 | 86 | 44 | 4.84 | 2.3 | 7.9 | 0 | 0 |
| August | 79.4 | 54.6 | 87 | 40 | 4.50 | 2.2 | 7.4 | 0 | 0 |
| September | 74.2 | 47.4 | 82 | 33 | 3.28 | 1.4 | 5.3 | 0 | 0 |
| October | 64.3 | 36.9 | 77 | 25 | 3.12 | 1.4 | 5.5 | [2] | [3] |
| November | 50.6 | 28.5 | 66 | 14 | 3.14 | 1.6 | 4.7 | 4 | 2 |
| December | 40.2 | 20.2 | 57 | 3 | 3.71 | 2.0 | 6.1 | 14 | 3 |
| Year | 60.4 | 36.3 | [4] 91 | [5] 13 | 48.51 | 42.6 | 54.4 | 56 | 3 |

[1] Period of record, 1940–60.
[2] Less than one-half day.
[3] Less than one-half an inch.
[4] Average annual highest temperature.
[5] Average annual lowest temperature.

Data in table 10 and in the text are based on the climatic record at Oakland, located in the southwestern part of the county, which is the county's oldest operating station. The widely varying topography is an important factor contributing to marked differences in climate throughout the county. In the valleys of the southeast, for example, temperatures are generally warmer and precipitation is less than in other areas of the county.

The warmest period of the year is the latter part of July, when the maximum afternoon temperature averages about 82°. Temperatures of 90° and higher occur on an average of only 3 days a year at Oakland and have ranged from none, which occurs quite frequently, to 14 in 1930 and 1953. Only twice in Oakland's record have temperatures of 100° or higher occurred. The coldest period is the latter part of January and the first of February, when the early morning minimum temperature averages 32° or lower.

Freeze data, giving the average dates of the last spring and first fall occurrences of minimum temperature equal to or below specified threshold values, are given in table 11. The period between the last freezing temperature in spring and the first in fall, defined as the growing season, averages only 122 days.

Distribution of precipitation is uniform throughout the year as monthly totals range from 3.12 inches to 4.81 inches. During the period 1904 to 1969, the annual precipitation at Oakland ranged from a low of 29.41 inches in the drought year 1930, to a high of 63.15 inches in 1956. Drought can occur in any month or season, but serious drought is most likely to occur in summer. Generally, rainfall and the stored soil moisture are adequate for most farming needs.

Snowfall averages 71 inches in a winter season, but has ranged from a high of 126 inches in the winter of 1959–1960 to a low of 39 inches in the winter of 1918–1919. There is considerable variation throughout the county, as average totals are about 35 inches at the lower elevations of the southeastern part. Snowfall at weather stations near Bittinger and at Sines has averaged more than 100 inches in recent years.

Thunderstorms, based on the 15-year period 1931–1945, occur on an average of 35 days per year; 75 percent of these occur during May through August. Tornadoes are rare; two per year, on the average, are reported in the state. About once every 3 or 4 years, tropical storms or hurricanes affect the area, generally during the period August through October. They normally produce heavy rainfall, but are seldom accompanied by winds exceeding 50 miles per hour.

Prevailing winds are from the west to northwest, except in summer when they are more southerly. The average annual windspeed is about 9 miles per hour, but winds reach 50 to 60 miles per hour, or even higher, during storms. Strong winds during and after snowstorms frequently bring blizzard conditions and drifting snow.

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TABLE 11.—*Probabilities of last freezing temperatures in spring and first in fall*

[All data from Oakland, elevation 2,420 feet]

| Probability | Dates for given probability and temperature | | |
|---|---|---|---|
| | 32 °F. or lower | 24 °F. or lower | 16 °F. or lower |
| Spring: | | | |
| 9 years in 10 later than (90%) | May 5 | April 10 | March 4 |
| 3 years in 4 later than (75%) | May 14 | April 17 | March 13 |
| 2 years in 3 later than (67%) | May 17 | April 20 | March 17 |
| 1 year in 2 later than (50%) | May 23 | April 25 | March 24 |
| 1 year in 3 later than (33%) | May 29 | April 30 | March 31 |
| 1 year in 4 later than (25%) | June 1 | May 3 | April 4 |
| 1 year in 10 later than (10%) | June 10 | May 10 | April 13 |
| Fall: | | | |
| 1 year in 10 earlier than (10%) | September 8 | October 2 | October 22 |
| 1 year in 4 earlier than (25%) | September 15 | October 8 | October 30 |
| 1 year in 3 earlier than (33%) | September 17 | October 11 | November 2 |
| 1 year in 2 earlier than (50%) | September 22 | October 15 | November 8 |
| 2 years in 3 earlier than (67%) | September 27 | October 19 | November 14 |
| 3 years in 4 earlier than (75%) | September 29 | October 22 | November 17 |
| 9 years in 10 earlier than (90%) | October 6 | October 28 | November 25 |

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1968. UNIFIED SOIL CLASSIFICATION SYSTEM FOR ROADS, AIRFIELDS, EMBANKMENTS AND FOUNDATIONS. MIL-STD-619B, 30 pp., illus.

## Glossary

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

**Available water capacity** (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

**Base saturation.** The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.

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

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

**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.

**Drainage class** (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation 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 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 and upper B horizons and have mottling in the lower B and the C horizons.

*Somewhat poorly drained* soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

*Poorly drained* soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

*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 deeper parts of the profile.

**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 (sandblast), running water, and other geological agents.

**Flood plain.** Nearly level land, consisting of stream sediment, 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.

**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 (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by 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.

**Mottling, soil.** 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.

**Parent material.** Disintegrated and partly weathered rock from which soil has formed.

**Permeability.** The quality that enables the soil 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.*

**Poorly graded.** A soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles in poorly graded soil material, density can be increased only slightly by compaction.

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

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

| | *pH* | | *pH* |
|---|---|---|---|
| Extremely acid | Below 4.5 | Mildly alkaline | 7.4 to 7.8 |
| Very strongly acid | 4.5 to 5.0 | Moderately alkaline | 7.9 to 8.4 |
| Strongly acid | 5.1 to 5.5 | Strongly alkaline | 8.5 to 9.0 |
| Medium acid | 5.6 to 6.0 | Very strongly alkaline | 9.1 and higher |
| Slightly acid | 6.1 to 6.5 | | |
| Neutral | 6.6 to 7.3 | | |

**Relief.** The elevations or inequalities of a land surface, considered collectively.

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

**Silt.** Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

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

**Soil separates.** Mineral particles, less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *Very coarse sand* (2.0 to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeter); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

**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.

**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 either *single grain* (each grain by itself, as in dune sand) or *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.

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

**Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

**Terrace (geological).** An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

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

**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.

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

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