SOIL SURVEY

Wood and Wirt Counties West Virginia

OUR SOIL ★ OUR STRENGTH

Issued April 1970

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In Cooperation with
WEST VIRGINIA AGRICULTURAL EXPERIMENT STATION

Major fieldwork for this soil survey was done in the period 1957–64. Soil names and descriptions were approved in 1966. Unless otherwise indicated, statements in the publication refer to conditions in the counties in 1964. This survey was made cooperatively by the Soil Conservation Service and the West Virginia Agricultural Experiment Station. It is part of the technical assistance furnished to the Little Kanawha Soil Conservation District.

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

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Wood and Wirt Counties, W. Va., contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in appraising the value of tracts of land for agriculture, industry, or recreation.

Locating Soils

All of the soils of Wood and Wirt Counties are shown on the detailed map at the back of this survey. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. 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 in the survey. This guide lists all of the soils of the two counties in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit and the woodland suitability group, in which the soil has been placed.

Interpretations not included in the text can be developed by using the soil map and 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 in the soil descriptions and in the discussions of the capability units.

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

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

Community planners and others concerned with recreational and nonfarm uses can read about the soil properties that affect the choice of homesites, industrial sites, schools, and parks in the section "Recreational and Nonfarm Uses of Soils."

Engineers and builders will find under "Engineering Uses of Soils" tables that give engineering descriptions of the soils in the two counties and that name soil features that affect engineering practices and structures.

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

Newcomers in Wood and Wirt Counties may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the Area," which gives additional information about the two counties.

U.S. GOVERNMENT PRINTING OFFICE: 1970

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

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SOIL SURVEY OF WOOD AND WIRT COUNTIES, WEST VIRGINIA

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UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH WEST VIRGINIA AGRICULTURAL EXPERIMENT STATION

WOOD AND WIRT COUNTIES, in the western part of West Virginia (fig. 1), have a total land area of about 602 square miles or about 385,280 acres. The area of Wood County is about 368 square miles, or about 235,520 acres, and that of Wirt County is about 234 square miles, or about 149,760 acres.

The Ohio River forms the western boundary of Wood County. The Little Kanawha River flows northwestward through the two counties and empties into the Ohio River at Parkersburg in Wood County. Parkersburg is the county seat of Wood County, and it is the largest city in the county. Elizabeth is the county seat of Wirt County; it is on the Little Kanawha River.

About 70 percent of the two counties is woodland, and the sale of forest products is an important source of income. In most of the acreage of the two counties, the soils are hilly, and most of the farms are of the general type. Raising beef cattle is the principal farm enterprise, but dairying is important in the vicinity of Parkersburg. A small acreage is in burley tobacco. Some farming areas, particularly those along the Ohio River in Wood County, are being withdrawn for use in residential and industrial development.

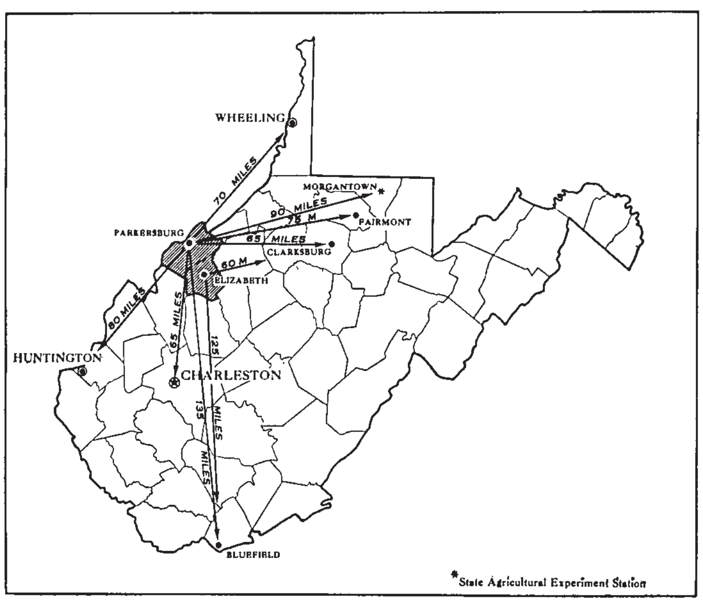

Figure 1.—**Location of Wood and Wirt Counties in West Virginia.**

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Wood and Wirt Counties, where they are located, and how they can be used. The soil scientists went into the counties knowing they likely would find many soils they had already seen and perhaps some they had not. As they traveled over the counties, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; 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 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. Markland and Upshur, 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 go with their behavior in the natural landscape.

Soils of one series can differ somewhat 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, Markland silt loam, 3 to 10 percent slopes, is one of several phases within the Markland series.

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

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning 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 kinds 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 Wood and Wirt Counties: soil complexes and undifferentiated groups.

A soil complex consists of two or more soils so intricately mixed 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 of 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. Upshur-Muskingum complex, 3 to 10 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 survey, there is no value separating them. The pattern and proportion of the soils are not uniform. An area shown on the map may make up only one of the dominant soils, or of two or more. The name of the undifferentiated group consists of the names of the dominant soils, joined by "and." Monongahela and Tilsit silt loams, 0 to 3 percent slopes, is an example.

In most areas surveyed there are areas where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These areas are shown on the soil map and are described in the survey, but they are called land types instead of soils and are given descriptive names. Made land and Steep land, alluvial materials, are examples of two land types in Wood and Wirt Counties.

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 soils in other places are assembled from farm records and from field or plot experiments on the same kinds of soils. 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 a way that it is readily useful to different groups of readers, among them farmers, managers of woodland, engineers, and homeowners.

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, and 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 present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Wood and Wirt Counties. 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, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The eight soil associations in Wood and Wirt Counties are described in the following pages. The terms for texture—"silty" and "clayey"—used in the title of the soil associations apply to the surface layer.

1. Huntington-Ashton-Wheeling Association

Deep, well-drained, mainly nearly level and gently sloping, silty soils on bottom lands and terraces along the Ohio River

This association occurs mainly as a long band along the Ohio River in the northern and northwestern parts of Wood County and on some islands in the Ohio River. It consists mainly of nearly level and gently sloping soils, but some areas of very steep soils are along the banks of the river, on rims of terraces, and in local dissected areas. This association makes up about 5 percent of the two counties. Within the association are the town of Parkersburg and other towns and industrial areas.

These towns and industrial areas make up about 60 percent of the association; Huntington soils, 10 percent; Ashton soils, 5 percent; Wheeling soils, 5 percent; and minor soils, 20 percent.

Huntington and Ashton soils are on the bottom lands (fig 2). These soils are deep, well drained, brownish, and fertile. They developed in alluvium washed from soils of the upland that have been influenced by limestone. The Huntington soils are lower than the Ashton soils and are flooded more frequently. The Wheeling soils are on the terraces and are not susceptible to flooding. These soils are deep, well drained, and brownish. They developed mainly in silty material that is underlain by sand or sand and gravel at a depth of 3 to 6 feet.

The minor soils in this association are the Lindside, Melvin, Sciotoville, Ginat, Lakin, and Duncannon. The Lindside soils are moderately well drained and somewhat poorly drained, and the Melvin soils are poorly drained.

Figure 2.—**An intensively farmed area of Huntington and Ashton soils in soil association 1.**

Both kinds of soils occur on bottom lands. The moderately well drained Sciotoville and the poorly drained Ginat soils occur on terraces. The excessively drained Lakin and the well-drained Duncannon soils occur mainly on terraces and adjacent hill slopes in the vicinity of Washington, Vienna, and Boaz.

Almost all of this association has been cleared. Much of the acreage of Huntington, Lindside, and associated soils on bottom lands is used for dairying, raising beef cattle, and general farming. Corn is the most commonly grown row crop, and truck crops are grown in a small acreage. Farming is fairly extensive in the vicinity of Belleville.

Much of the acreage of this association, particularly near Washington, Vienna, and Boaz, has been withdrawn for use in residential and industrial development. The Wheeling and Sciotoville soils on terraces are well suited to housing and industrial development.

2. Markland-McGary-Cotaco-Hackers Association

Deep, well-drained to poorly drained, mainly nearly level to strongly sloping, silty soils with silty and clayey subsoils; on terraces and bottom lands along the Little Kanawha River

This association consists of soils on slack water terraces along stream terraces and on bottom lands. Most of it is along the Little Kanawha River between Parkersburg in Wood County and Elizabeth in Wirt County. The soils are mainly nearly level to strongly sloping, but they are very steep in some areas along banks of the Little Kanawha River, on rims of terraces, and in local dissected areas. This association makes up about 6 percent of the two counties.

Markland soils make up about 20 percent of the association; McGary soils, 10 percent; Cotaco soils, 10 percent; Hackers soils, 10 percent; towns and industrial areas, 25 percent; and minor soils, the remaining 25 percent.

The Markland and McGary soils occur on terraces and are above flood stage. These soils are most extensive in the vicinity of South Parkersburg, Pettyville, and Bonnivale in Wood County and near Newark in Wirt County. They are deep, yellowish-brown to grayish soils that have developed in calcareous silt and clay material deposited by slack water. They are clayey in the fine textured part of the subsoil. Markland soils are moderately well drained, and McGary soils are somewhat poorly drained to poorly drained.

The Cotaco soils are on low stream terraces but are not susceptible to flooding. They are deep, moderately well drained, and have a seasonal high water table. Hackers soils occur in the higher areas of the bottom lands and are flooded occasionally. They are deep, well-drained, reddish soils that developed in alluvium washed mainly from areas of Upshur and Muskingum soils on uplands.

Minor soils in this association are the Monongahela, Allen, Moshannon, Senecaville, and Melvin. The moderately well drained Monongahela and the well drained Allen soils occur on the higher terraces. The Moshannon soils are deep and well drained, Senecaville soils are moderately well drained and somewhat poorly drained, and Melvin soils are poorly drained. These soils occur on bottom lands and are susceptible to flooding.

The best soils for farming in this association are on the bottom lands. These soils generally are moderate to high in natural fertility, and they hold moisture well. They are used mainly for crops and hay. The soils on terraces also are moderate to high in natural fertility but are waterlogged in winter and are slow to warm up in spring. Because of wetness, the soils on terraces are better suited to pasture than to row crops and deep-rooted legumes.

The soils in some areas near Parkersburg are used for housing development. The well-drained soils on terraces are good homesites. The use of the more poorly drained soils for septic tank filter fields is limited, but these soils are suitable as sites for houses where a community sewage system is available.

3. Moshannon-Monongahela-Hackers Association

Deep, well drained and moderately well drained, mainly nearly level and gently sloping, silty soils on bottom lands and terraces along the Little Kanawha and Hughes Rivers and Reedy Creek

This association occupies bottom lands and terraces mainly along the Little Kanawha and Hughes Rivers and Reedy Creek in Wirt County, but it also occurs as small areas along Pond Creek and the North Fork of Lee Creek in Wood County. It consists mainly of nearly level and gently sloping soils, but in some areas the soils are very steep. This association makes up about 6 percent of the two counties.

Moshannon soils make up about 50 percent of the association; Monongahela soils, 20 percent; Hackers soils, 5 percent; and minor soils, the remaining 25 percent.

The Moshannon soils occur on first bottoms. Hackers soils are on second bottoms and are most extensive along the Little Kanawha and Hughes Rivers. They are flooded less frequently than Moshannon soils. Both Hackers and

Moshannon soils are deep, reddish, and well drained. They developed in alluvium that washed from soils of the uplands, mainly the Upshur and Muskingum. The Monongahela soils occur on many small, high terraces and are moderately well drained.

The minor soils in this association are the Senecaville, Melvin, Allen, Cotaco, Zoar, Vandalia, and Tygart. Senecaville soils are moderately well drained and somewhat poorly drained, and the Melvin soils are poorly drained. Both kinds occur on bottom lands. The well drained Allen, the moderately well drained Cotaco and Zoar, and the somewhat poorly drained Tygart soils occur on terraces. The well-drained Vandalia soils are on the foot slopes.

The soils in this association are important for farming. They are used mainly for cultivated crops and hay, but areas on hills are pastured.

The well-drained, gently sloping to strongly sloping soils on terraces are good sites for buildings, and some areas are suitable as sites for cabins, camps, or other recreational uses. Some areas along the rivers can also be developed for recreational uses.

4. Monongahela-Upshur-Muskingum-Zoar Association

Deep and moderately deep, moderately well drained and well drained, gently sloping to very steep, silty and clayey soils on dissected high terraces and uplands

This association occurs mainly on high terraces and uplands in the vicinity of Lubeck and the Wood County Airport in Wood County and near Center Hill in Wirt County. It consists of gently sloping to strongly sloping soils on terraces and of moderately steep to very steep soils along the valley walls and in local dissected areas. Many areas are severely eroded. This association makes up about 11 percent of the two counties.

Monongahela soils make up about 35 percent of the association; Upshur soils, 25 percent; Muskingum soils, 15 percent; Zoar soils, 5 percent; and minor soils, the remaining 20 percent.

The Monongahela and Zoar soils occur on high terraces. These soils are deep, moderately well drained, and have moderately slow to slow permeability. Monongahela soils contain a fragipan. They are yellowish-brown, silty soils that developed in material washed from acid sandstone and shale. The Zoar soils are most extensive in the vicinity of Wood County Airport. They are brownish and reddish soils that developed in acid silt and clay. The Upshur and Muskingum soils are closely intermingled and occur mainly along the valley walls and in local dissected areas. In places they separate the Monongahela and Zoar soils on high terraces from the Wheeling soils that are on lower terraces in soil association 1. The Upshur and Muskingum soils are well drained. The deep, reddish Upshur soils developed on red and brownish, calcereous clay shale, and the moderately deep, yellowish-brown Muskingum soils developed on acid sandstone and shale.

The minor soils in the association are the Allen, Vandalia, Senecaville, and Moshannon. The Allen and Vandalia soils are deep and well drained. Allen soils occur on terraces scattered throughout the association, and Vandalia soils are on foot slopes. The Senecaville soils are deep and moderately well drained and somewhat poorly drained, and Moshannon soils are deep and well drained. Both kinds of soils occur on low, narrow bottom lands.

The major soils in this association are used mainly for hay and pasture. Natural fertility is low in the Monongahela and Zoar soils and is moderate in the Upshur and Muskingum soils. Some areas, particularly those near the Wood County Airport, that were formerly farmed have reverted to woodland consisting of Virginia pine. Some areas, especially those in the vicinity of Lubeck, are in community development. This association is suitable as sites for homes, but the clayey soils are poorly suited for use as septic tank drainage fields.

5. Muskingum Association

Moderately deep, well-drained, mainly moderately steep to very steep, silty soils on uplands

This association occurs on a single area along the Burning Springs Anticline in the eastern part of Wood County. It consists mainly of moderately steep to very steep, moderately eroded soils. This association makes up about 1 percent of the two counties.

Muskingum soils make up about 95 percent of this association and the Tilsit soils, the remaining 5 percent.

The Muskingum soils are moderately deep and well drained. Their subsoil is yellowish brown. These soils developed on acid siltstone, sandstone, and shale.

The minor Tilsit soils also developed on acid sandstone, siltstone, and shale. They occur on ridgetops. Tilsit soils are deep, yellowish brown, and gently sloping to strongly sloping. They contain a fragipan and are moderately well drained.

Almost all of this association is woodland. The trees are oak and associated hardwoods. Some areas have good potential for development for hunting, camping, and other recreational activities.

6. Upshur-Muskingum-Brooke Association

Deep and moderately deep, well-drained, mainly strongly sloping to moderately steep, clayey and silty soils on uplands

This association is in the southwestern and eastern parts of Wood County and the northwestern part of Wirt County. It consists of strongly sloping to moderately steep soils on ridgetops and benches and of steep to very steep soils on hillsides and on breaks between the benches (fig. 3). These soils are severely eroded or very severely eroded in most places. Slips are common in some areas. This association makes up about 15 percent of the two counties.

The Upshur soils make up about 55 percent of the association; Muskingum soils, 15 percent; Brooke soils, 10 percent; and minor soils, the remaining 20 percent.

This association consists mainly of closely intermingled Upshur and Muskingum soils that occur on the lower benches and slopes and of closely intermingled Upshur and Brooke soils on ridgetops and upper benches. The

Figure 3.—**Typical landscape in soil association 6. Closely intermingled Upshur and Muskingum soils are on the lower benches and slopes. Closely intermingled Upshur and Brooke soils are on the ridgetops and upper benches.**

Upshur soils are deep, well drained, reddish, and clayey. They developed on reddish and brownish, calcareous clay shale. Muskingum soils are moderately deep, well-drained, silty soils that developed on acid siltstone, sandstone, and shale. The Brooke soils are moderately deep and well drained. They developed on gray, calcareous shale and limestone and are yellowish brown to olive.

The minor soils in this association are the Vandalia, Moshannon, and Senecaville. The Vandalia soils are well drained and occur on foot slopes. The well drained Moshannon and the moderately well drained and somewhat poorly drained Senecaville soils occur on narrow bottom lands.

The soils in this association are high in natural fertility and are well suited to grasses and legumes. Because these soils are sticky, plastic, and difficult to plow, they are poorly suited to cultivated crops. Soils on ridgetops and benches are used mainly for hay, and those on the lower slopes are pastured. Areas suitable for hunting can be developed.

7. Muskingum-Upshur-Vandalia Association

Deep and moderately deep, well-drained, hilly and moderately steep to very steep, silty and clayey soils on uplands and foot slopes

This association is in the eastern and southeastern parts of Wirt County and occupies areas where rough hills are dominant. It consists of moderately steep soils on narrow ridgetops, very steep soils on hillsides, and steep soils on narrow benches. These soils are moderately eroded to severely eroded. This association makes up about 11 percent of the two counties.

The Muskingum soils make up about 40 percent of this association; Upshur soils, 35 percent; Vandalia soils, 10 percent; and minor soils, the remaining 15 percent.

This association consists mainly of closely intermingled Muskingum and Upshur soils, but some areas consist only of Muskingum soils, and some consist only of Upshur soils. Both Muskingum and Upshur soils are well drained. Muskingum soils are moderately deep and silty and have a yellowish-brown subsoil; Upshur soils are deep, reddish, and clayey. Muskingum soils are common along the valley walks in the vicinity of Creston. The Vandalia soils occur on foot slopes and are deep and well drained, and have a reddish subsoil.

The minor soils in this association are the Senecaville and Moshannon soils on bottom lands and the Tilsit soils on ridges that are scattered throughout the association.

Farming in this association is mainly on the ridgetops and in the narrow valleys; the farms are of the general type. A large part of this association is wooded. Some areas can be developed for fishing, hunting, and other recreational activities.

8. Upshur-Muskingum-Vandalia Association

Deep and moderately deep, well-drained, sloping to very steep, clayey and silty soils on uplands and foot slopes

This association occupies large hilly areas and narrow valleys scattered throughout Wood and Wirt Counties. It consists mainly of moderately steep soils on narrow and moderately wide ridgetops and benches and steep to very steep soils on hillsides and breaks between the benches (fig. 4). A large part of this association is severely eroded, but some areas are moderately eroded. Slips, gall spots, and gullies are common in some areas. This association makes up about 45 percent of the two counties.

Upshur soils make up about 50 percent of the association; Muskingum soils, 25 percent; Vandalia soils, 10 percent; and minor soils, the remaining 15 percent.

In this association the Upshur and Muskingum soils are closely intermingled, but some areas consist only of Upshur soils, and some consist only of Muskingum soils. Upshur soils are deep and well drained. They developed on red, calcareous clay shale. The Muskingum soils are moderately deep and well drained. They developed on yellowish-brown, acid sandstone and shale. Vandalia soils occur on foot slopes throughout this association. They are deep, well-drained, reddish soils that developed from colluvium washed mainly from areas of Upshur and Muskingum soils.

Figure 4.—**Closely intermingled Upshur and Muskingum soils in a landscape typical of soil association 8.**

The minor soils in this association are the Senecaville, Moshannon, and Tilsit. The Senecaville and Moshannon soils occur on bottom lands and are deep. The Senecaville soils are moderately well drained and somewhat poorly drained, and the Moshannon soils are well drained. The deep, moderately well drained, gently sloping Tilsit soils occur on ridgetops.

In this association, most areas used for crops and hay are on the ridgetops and benches. The Upshur and Muskingum soils are well suited to bluegrass, and they are used mostly for permanent pasture. The larger areas of bottom lands are used for crops and hay and the adjacent hills are in pasture. Some areas in this association can be developed for hunting, fishing, and other recreational activities.

Use and Management of Soils

The soils of Wood and Wirt Counties are used extensively for crops, trees, and pasture. This section explains how the soils can be managed for these main purposes and also for wildlife and recreational and nonfarm uses and in the building of highways, farm ponds, and other engineering structures. Also given are the estimated yields of the principal crops and pasture grasses.

In presenting information about the use of soils for crops and pasture, as woodland for wood products, and for wildlife habitat, the procedure is to describe a group that is made up of similar soils that are suitable for those purposes and to suggest use and management for the group. To determine the soils in each capability unit and woodland group, refer to the "Guide to Mapping Units" at the back of this survey. In the section on engineering, the soils are not grouped but are placed in tables so that properties significant to engineering work can be readily given. In the section on recreational and nonfarm uses, the soils are rated according to their limitations for selected uses.

Capability Groups of Soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The classification does not apply to most horticultural crops, or to rice and other crops that have their own special requirements. The soils are classified according to degree and kind of permanent limitations, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils, and without consideration of possible major reclamation projects.

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

CAPABILITY CLASSES, the broadest grouping, are designated by Roman numerals, I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I. Soils have few limitations that restrict their use.

Class II. Soils have some limitations that reduce the choice of plants or 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 restrict 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, woodland, or wildlife food and cover.

Class VI. Soils have severe limitations that make them generally unsuitable to cultivation and limit their use largely to pasture, woodland, or wildlife food and cover.

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

Class VIII. Soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes. (None in Wood and Wirt Counties.)

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 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 some parts of the United States, but not in Wood and Wirt Counties, 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 subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, woodland, wildlife, 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-15. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation, and the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph. The Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units

The soils in Wood and Wirt Counties have been placed in 37 capability units. The soils in each unit have about the same limitations, are subject to similar risks of damage, need about the same kind of management, and respond to management in about the same way. The capability units are not numbered consecutively, because not all the units used in West Virginia are in these two counties.

In the following pages each capability unit is described, and management for each is discussed. The names of the soil series represented are given in the description of each capability unit, but this does not mean that all of the soils in a given series are in the unit. To determine the soils in a capability unit, refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT I-4

This unit consists of deep, well-drained, nearly level soils on terraces and high bottom lands above flood stage. These soils are in the Hackers and Wheeling series. The soils in this unit are strongly acid to very strongly acid, are moderate to high in natural fertility, and hold moisture moderately well. Fields that have been cropped intensively generally are low in potash. These soils are easily worked, and crops on them respond well to good management.

The soils in this unit are well suited to the crops commonly grown in the two counties. Under good management, corn, potatoes, truck crops, and hay and pasture plants grow well. Corn can be grown every year if good tilth and fertility are maintained. A winter cover crop protects these soils and helps to maintain tilth and fertility. More suitable than continuous corn, however, is a cropping system that includes a hay crop every 3 or 4 years. These soils are well suited to grass-legume mixtures grown for hay or pasture. In pastures tall grasses grow better than permanent bluegrass.

CAPABILITY UNIT I-6

This unit consists of deep, well-drained, nearly level soils on high bottom lands. Flooding is likely not more than once every 5 years. These soils are in the Ashton, Hackers, and Huntington series. They are medium acid to slightly acid, are high in natural fertility, and hold moisture well. They are easily worked, and crops on them respond well to good management.

If properly managed, the soils in this unit are well suited to corn, potatoes, truck crops, and hay and pasture plants. Corn can be grown every year, but a winter cover crop is needed so as to protect these soils and to maintain soil tilth and fertility. More suitable than continuous corn, however, is a cropping system that includes a hay crop every 3 or 4 years. Grass-legume mixtures grow well where seeded for hay or pasture. In pastures tall grasses grow better than bluegrass. These soils are suited to irrigation.

CAPABILITY UNIT IIe-4

This unit consists of deep, well-drained, nearly level to gently sloping soils on terraces. These soils are in the Allen, Duncannon, Hackers, and Wheeling series. Except for the Allen soil, the soils in this unit are moderate to high in natural fertility; the Allen soil is low in natural fertility. These soils hold moisture moderately well and are strongly acid to very strongly acid. Potash is commonly low in fields that have been cropped intensively. These soils are easily worked, and crops on them respond well to good management. Erosion is a moderate hazard.

If properly managed, the soils in this unit are well suited to corn, potatoes, truck crops, and hay and pasture plants. Because of the erosion hazard, cultivated crops should not be grown every year. An example of a suitable cropping system is corn followed by a small grain, and then 1 year or more of hay. Contour farming is needed, and natural draws should be kept in sod.

CAPABILITY UNIT IIe-6

This unit consists of deep, well-drained, gently sloping to sloping soils on high bottom lands. These soils are mainly in low ridgelike areas parallel to streams. Flooding is likely not more than once every 5 years. These soils are in the Ashton, Hackers, and Huntington series. These soils are medium acid to slightly acid, are high in natural fertility, and hold moisture well. They are easily worked, and crops on them respond well to good management.

If properly managed, the soils in this unit are well suited to corn, potatoes, truck crops, and hay and pasture plants. Cultivated crops should not be grown every year. An example of a suitable cropping system is corn followed by a small grain, and then 1 year or more of hay.

CAPABILITY UNIT IIe-13

This unit consists of deep, moderately well drained, gently sloping soils on terraces and uplands. These soils are in the Cotaco, Monongahela, Sciotoville, Tilsit, and Zoar series. They occur mainly on old, high terraces. They have a fragipan or a clayey layer in the subsoil through which water and air move slowly. The soils in this unit are acid and are moderate to low in natural fertility. Areas that have been cropped generally are low in potash and phosphate. These soils are moderately easy to work, and crops on them respond well to good management.

If properly managed, the soils in this unit are suited to corn, truck crops, and hay and pasture plants. An example of a suitable cropping system is corn followed by a small grain, and then 1 year or more of hay. Contour stripcropping is needed on long slopes, and natural draws should be kept in sod. Alfalfa generally does not last long, but it is commonly grown in a grass-legume mixture.

CAPABILITY UNIT IIe-14

Markland silt loam, 3 to 10 percent slopes, is the only soil in this unit. It is a deep, moderately well drained soil on terraces. This soil developed in material deposited by slack water. It has a clayey subsoil through which water and air move slowly. This soil is moderate in natural fertility, and crops on it respond well to good management.

If properly managed, this soil is suited to corn and hay and pasture plants. Because of the hazard of erosion, cultivated crops should not be grown every year. An example of a suitable cropping system is corn followed by a small grain, and then 1 year or more of hay. The management needed is contour farming, where slopes are favorable, and maintaining natural draws in sod. Deep-rooted legumes generally grow well, but they may not last long in small areas that have poor surface drainage.

CAPABILITY UNIT IIe-15

This unit consists of deep and moderately deep, well-drained, gently sloping soils on broad ridgetops, foot slopes, and alluvial fans scattered throughout the two counties. These soils are in the Muskingum, Upshur, and Vandalia series. Water and air move slowly through the soils. These soils are medium acid to strongly acid, are low to high in natural fertility, and hold moisture well. Crops on them respond well to good management. These soils clod if they are worked when wet. The erosion hazard is moderate.

If properly managed, the soils in this unit are suited to corn and are well suited to hay and pasture plants. Because of the erosion hazard, cultivated crops should not be grown every year. An example of a suitable cropping system is corn followed by a small grain, and then 1 year or more of hay. Good management includes contour farming, contour stripcropping, where practical, and maintaining natural draws in sod.

CAPABILITY UNIT IIw-1

This unit consists of deep, moderately well drained, nearly level soils on stream terraces and uplands. These soils are in the Cotaco, Monongahela, Sciotoville, and Tilsit series. They have a fragipan in the lower part of the subsoil through which water and air move slowly. Runoff is moderately slow, and water is ponded for short periods in small concave areas. These soils are strongly acid to very strongly acid. They are low to moderate in natural fertility, particularly potash, but crops on them respond fairly well to good management.

If properly managed, the soils in this unit are suited to corn and hay and pasture plants. Corn can be grown every year if fertility and good tilth are maintained. A cover crop is needed so as to protect the soil during the winter. Crop residue should be worked into the soils to improve tilth and fertility. Drainage is needed in small wet areas. Deep-rooted legumes may not last long.

CAPABILITY UNIT IIw-6

This unit consists of deep, well-drained, nearly level and gently sloping soils on bottom lands. These soils are in the Moshannon and Huntington series. They are flooded occasionally. Generally these soils are covered by water for short periods. Some areas along the smaller streams near the Ohio River may be covered by backwater for 3 or 4 days. The soils in this unit are medium acid to neutral. They are high in natural fertility and hold moisture well. These soils are easily worked, and crops on them respond well to good management.

If properly managed, the soils in this unit are well suited to corn and hay and pasture plants. In some areas corn and early hay crops are damaged by floodwater. In many places the Huntington soils are covered by sediment deposited by the Ohio River and are poorly suited to hay and pasture. Corn can be grown every year if fertility and tilth are maintained. A cover crop is needed to protect the soils in winter and early in spring. Grass-legume mixtures grow well if seeded for hay and pasture. In pastures bluegrass grows well.

CAPABILITY UNIT IIw-7

This unit consists of deep, moderately well drained to well drained, nearly level soils on bottom lands. These soils are in the Lindside, Moshannon, and Senecaville series. They commonly occur along most streams in the two counties. The soils in this unit are medium acid to slightly acid, are moderate to high in natural fertility, and are easily worked. They have a seasonal high water table. The soils on low bottom lands are flooded occasionally, but those on high bottom lands are seldom flooded.

If properly managed, these soils are well suited to corn, truck crops, and hay and pasture plants. Occasionally a corn or an early hay crop may be damaged by floodwater. Corn can be grown every year if good tilth and fertility are maintained. A cover crop is needed so as to protect these soils during the winter. Deep-rooted legumes that are not water tolerant may not last long in areas that have poor surface drainage. Grass-legume mixtures grow well where seeded for hay and pasture. Deep-rooted legumes grow better if the seep spots are drained. In pastures bluegrass grows well.

CAPABILITY UNIT IIs-2

This unit consists of deep, well-drained, nearly level and gently sloping soils on terraces along the Ohio River. These soils are in the Wheeling series. They are underlain by sand and gravel at a depth of 3 to 6 feet. Water and air move through these soils at a moderately rapid to rapid rate, and plants may be damaged by a lack of water during droughts. These soils are acid and are moderate to high in natural fertility. Areas that have been cropped intensively generally are low in potash. These soils are easily worked, and crops on them respond well to good management. They are suitable for irrigation.

If properly managed, these soils are well suited to corn, truck crops, and hay and pasture plants. Corn can be grown every year if good tilth and fertility are maintained. A winter cover crop helps to protect the soils. Working the residue from crops into the soil improves tilth, fertility, and the moisture-holding capacity. A cropping system that includes 1 year or more of hay helps to maintain the organic-matter content. In pastures bluegrass does not grow well.

CAPABILITY UNIT IIs-6

Huntington fine sandy loam is the only soil in this unit. It is a deep, well-drained, nearly level to gently sloping soil on bottom lands along the Ohio River. This soil is flooded occasionally. Water and air move through this soil at a moderately rapid rate, and plants may be damaged by lack of water during extended droughts. This soil is high in natural fertility and is medium acid to strongly acid. Response to management, including irrigation, is good.

Under good management, corn, truck crops, and hay and pasture plants grow well on this soil. If fertility and good tilth are maintained, corn can be grown every year. A cover crop is needed so as to protect the soil in winter. Working the crop residue into the soil improves tilth, fertility, and moisture-holding capacity. A cropping system that includes 1 year or more of hay improves tilth and helps to maintain the organic-matter content.

CAPABILITY UNIT IIIe-4

This unit consists of deep, well-drained, strongly sloping soils on terraces and wind-deposited material. These soils are in the Allen, Duncannon, Hackers, and Wheeling series. Except for the Allen soil, all of the soils in this unit are moderate to high in natural fertility; the Allen soil is low in natural fertility. Potash is commonly low in fields that have been cropped. Available moisture capacity is moderate. Runoff is rapid in tilled areas. Crops on these soils respond well to good management.

If properly managed, the soils in this unit are suited to corn, truck crops, hay, and pasture. Because erosion is a hazard, row crops should not be grown every year. An example of a suitable cropping system is corn followed by a small grain, and then 2 years or more of hay. Contour farming and, where slopes are favorable, contour stripcropping are needed. Diversion terraces may be needed on long slopes to help control surface runoff. In pastures tall grass grows better than bluegrass.

CAPABILITY UNIT IIIe-6

Hackers silt loam, 10 to 20 percent slopes, is the only soil in this unit. It is a deep, well-drained soil influenced by lime. This soil occurs on bottom lands mainly along narrow breaks between low and high bottom lands and in dissected areas. Floods occur about every 5 or 6 years, or less frequently. This soil is high in natural fertility and holds moisture well, and crops on it respond well to good management.

Because this soil generally occurs in narrow bands, it is commonly used in the same way as are the adjacent soils. Under good management, corn, truck crops, and hay and pasture plants grow moderately well. Use for cultivated crops is limited by the erosion hazard. An example of a suitable cropping system is corn followed by a small grain, and then 2 years or more of hay. Contour farming is needed. In pastures tall grasses grow better than bluegrass.

CAPABILITY UNIT IIIe-10

Only one soil, Muskingum silt loam, 10 to 20 percent slopes, is in this unit. This soil is on uplands and is moderately deep and well drained. The movement of water and air through the loose, open subsoil is moderately rapid, and plants may be damaged by a lack of water during droughts. This soil is strongly acid and low to moderate in natural fertility, but crops on it respond to good management. Runoff is rapid, and erosion is a severe hazard.

Corn and hay and pasture plants grow moderately well on this soil if management is good. Because of the hazard of erosion and the difficulty in maintaining good soil tilth and fertility, cultivated crops should be grown at infrequent intervals. An example of a suitable cropping system is corn followed by a small grain, and then 2 years or more of hay. Needed for the control of erosion are contour farming and, on long slopes, contour stripcropping and diversion terraces. Natural draws should be kept in sod. In pastures bluegrass grows fairly well if management is good and includes additions of lime and fertilizer.

CAPABILITY UNIT IIIe-13

This unit consists of deep, moderately well drained, strongly sloping soils on terraces and uplands. These soils are in the Cotaco, Monongahela, and Zoar series. They have a fragipan or a clayey layer in the subsoil through which water and air move slowly. These soils are acid and are moderate to low in natural fertility, particularly in potash, but crops on them respond fairly well to good management. Erosion is a severe hazard.

If properly managed, the soils in this unit are suited to corn and hay and pasture plants. Because erosion is a hazard, these soils should be tilled only at infrequent intervals. An example of a suitable cropping system is a row crop followed by a small grain, and then 2 years or more of hay. Good management includes contour farming and, on long slopes, contour stripcropping. Natural draws should be left in sod. Alfalfa may not last long on these soils, but it is commonly used in grass-legume mixtures. In pastures bluegrass grows moderately well.

CAPABILITY UNIT IIIe-14

Markland silt loam, 10 to 20 percent slopes, is the only soil in this unit. This soil developed in soil material that has been influenced by lime and deposited by slack water. It is deep, is moderately well drained, and has a clayey subsoil that is slowly permeable to water and air. Available moisture capacity is moderate to high. This soil is moderate in natural fertility, and crops on it respond well to good management. Erosion is a severe hazard.

Under good management, corn and hay and pasture plants grow moderately well on this soil. Because the erosion hazard is severe, this soil should not be tilled too frequently. An example of a suitable cropping system is corn followed by a small grain, and then 2 years or more of hay. Contour farming and, where practical, contour stripcropping are needed to help slow runoff and control erosion. Natural draws should be left in sod. Alfalfa and bluegrass grow well on this soil.

CAPABILITY UNIT IIIe-15

This unit consists of deep to moderately deep, well-drained, strongly sloping soils on ridgetops, benches, and foot slopes throughout the two counties. These soils are in the Upshur, Muskingum, and Vandalia series. Water and air move slowly through these soils, and they hold moisture well. These soils are medium acid to very strongly acid and low to high in natural fertility. They are difficult to work, and they clod if worked when wet. Runoff is rapid in unprotected areas, and erosion is a severe hazard.

If properly managed, the soils in this unit are suited to corn and hay and pasture plants. An example of a suitable cropping system is corn followed by a small grain, and then 2 years or more or hay. Contour farming and, on long slopes, contour stripcropping and diversion terraces are needed to help slow runoff and control erosion. Natural draws should be left in sod. In pastures bluegrass grows well.

CAPABILITY UNIT IIIe-30

The only soil in this unit is Upshur silty clay loam, 3 to 10 percent slopes. This soil occurs mainly on ridgetops and upper benches in the two counties. It is deep or moderately deep, well drained, plastic, and sticky. Water and air move slowly through this soil, and it is difficult to work; in wet weather it is puddled by cultivation, and in dry weather it is hard. The hazard of erosion is severe.

The soil in this unit is limited in its suitability for cultivated crops. An example of a suitable cropping system is corn followed by a small grain, and then 2 years or more of hay. The management should include contour farming, contour stripcropping on long slopes, and diversion terraces where needed. Natural draws should be maintained in sod. This soil is well suited to grasses and legumes. Under good pasture management, bluegrass grows well.

CAPABILITY UNIT IIIw-1

This unit consists of deep, poorly drained, nearly level soils on bottom lands and terraces. These soils are in the Ginat and Melvin series. The soils are acid and are moderately high in natural fertility. Runoff is slow, and water is commonly ponded for long periods.

Excess water limits the suitability of these soils for crops, and drainage is needed before most crops can be grown successfully. Alfalfa does not grow well on these wet soils, but in drained areas used for pasture a mixture of grasses and clover that tolerate wetness provide good forage. An example of a suitable cropping system is a row crop followed by a small grain, and then 2 years or more of hay. In some places diversion terraces are needed along the base of adjacent slopes so that runoff from these slopes is intercepted.

CAPABILITY UNIT IIIw-5

This unit consists of somewhat poorly drained to poorly drained, nearly level soils that developed in alluvium deposited by slack water. These soils are in the Tygart and McGary series. They have a clayey subsoil through which water and air move slowly. The Tygart soil is acid throughout, and the McGary soil is neutral in the lower subsoil.

The soils in this unit are used mainly for hay and pasture, but they can be used for corn if management is good. Drainage is needed before these soils can be successfully cropped. A way to intercept runoff from adjacent slopes is constructing diversion terraces at the base of the slopes. An example of a suitable cropping system is corn followed by a small grain, and then 2 years or more of hay. Alfalfa is not suited to these wet soils, but mixtures of water-tolerant grasses and clover grow moderately well where seeded for hay and pasture.

CAPABILITY UNIT IIIs-1

This unit consists of deep, sandy, gently sloping soils on stream terraces and on wind-deposited material along the Ohio River. These soils are in the Lakin series. Water and air move through these soils at a rapid rate, and crops on them are damaged in summer by a lack of moisture. These soils are low to moderate in natural fertility. They are easily worked, and crops on them respond fairly well to good management.

Most crops common in the area can be grown on the soils in this unit, but a lack of moisture slows growth. Under good management, corn is suitable. Good management includes adding fertilizer, seeding a cover crop to help maintain the organic-matter content, and returning crop residue to the soil to help to improve fertility and the moisture-holding capacity. A cropping system that provides 1 year or more of hay helps to increase the content of organic matter and the moisture available to plants. These soils can be irrigated, but frequent applications of water are needed. Deep-rooted grasses and legumes grow fairly well. In pastures bluegrass grows slowly.

CAPABILITY UNIT IVe-3

This unit consists of deep, well-drained, strongly sloping and steep soils on old, high terraces, on uplands, and on wind-deposited material. These soils are in the Allen, Duncannon, Hackers, and Muskingum series. They are acid, moderate to low in natural fertility, and hold water fairly well. These soils are easily tilled. Erosion is a severe hazard.

The soils in this unit are well suited to hay and pasture. A row crop can be safely grown only occasionally. Where these soils are cultivated, runoff is rapid, and the hazard of erosion is increased. An example of a suitable cropping system is corn followed by a small grain, and then 3 years or more of hay. Practices needed to reduce runoff and control erosion are farming on the contour, or on long slopes, in contour strips, and maintaining natural draws in sod. Grass-legume mixtures grow moderately well where seeded for hay and pasture. In pastures bluegrass does moderately well on these soils.

CAPABILITY UNIT IVe-9

This unit consists of deep, moderately well drained, strongly sloping and steep soils on terraces and uplands near the Ohio and Little Kanawha Rivers. These soils are in the Markland, Monongahela, Tilsit, and Zoar series. They have a fragipan or a clayey layer in the subsoil through which water and air move slowly. Except for the Markland soil, these soils are low in natural fertility; the Markland soil is moderate in natural fertility. Available moisture capacity is moderate, and runoff is rapid in cultivated areas. Most of these soils have been severely eroded.

The soils in this unit are better suited to hay and pasture than to cultivated crops, but if the soils are carefully managed, a row crop can be grown occasionally. An example of a suitable cropping system is corn followed by a small grain, and then 3 years or more of hay. Contour farming and, on long slopes, contour stripcropping are needed to reduce runoff and control erosion. Natural draws should be maintained in sod. Alfalfa may not last long on these soils, but it grows well if used in a grass-legume mixture. In pastures bluegrass grows only moderately well.

CAPABILITY UNIT IVe-15

This unit consists of deep to moderately deep, well-drained, moderately steep and strongly sloping soils that occur mainly on ridgetops, benches, and foot slopes throughout the two counties. These soils are in the Muskingum, Upshur, and Vandalia series. They are moderate to high in natural fertility, and water and air move through them slowly. Some areas are severely eroded. A few gall spots, slips, or gullies occur in most areas. Crops on these soils respond well to good management.

The soils in this unit are better suited to hay and pasture than to cultivated crops because runoff is rapid. A row crop can be grown occasionally if runoff is controlled and fertility is maintained. An example of a suitable cropping system is corn followed by a small grain, and then by 3 or more years of hay. Practices needed to reduce runoff and control erosion are farming on the contour and, on long slopes, in contour strips. Natural draws should be kept in sod. Diversion terraces are needed in some places to help control runoff from higher areas. Alfalfa grows well on these soils. Grass-legume mixtures grow moderately well or well where seeded for hay and pasture. Bluegrass grows fairly well on these soils, but good pasture management is needed to control soil and water losses.

CAPABILITY UNIT IVe-30

This unit consists of deep to moderately deep, well-drained, strongly sloping soils. These soils are in the Upshur and Brooke series. They are plastic and sticky soils through which water and air move slowly. They are strongly acid to neutral and are high in natural fertility. Surface runoff is rapid, and in most areas erosion has removed most of the original surface soil. The hazard of further erosion is very severe. In some areas a few gall spots, slips, or gullies occur. These soils are difficult to plow, and they are hard and cloddy if worked when too wet. They are high in natural fertility, and crops on them respond well to good management.

The soils in this unit are well suited to hay and pasture. Legumes generally grow well, but they may be damaged in winter. A row crop can be grown occasionally if management is good. An example of a suitable cropping system is corn followed by a small grain, and then 3 years or more of hay. Contour tillage and, on long slopes, contour strips are needed. Diversion terraces are needed in some areas to help control runoff from high slopes, and natural draws should be maintained in sod.

CAPABILITY UNIT IVs-1

Lakin loamy fine sand, 10 to 20 percent slopes, is the only soil in this unit. This soil is deep, and it occurs in hummocky and dunelike areas along the Ohio River. Water and air move rapidly through this soil, and it is droughty. This soil is moderately low in natural fertility, particularly in potash, and frequent applications of fertilizer generally are needed. It is easy to work, but maintaining fertility and moisture is difficult.

On this soil, a suitable cropping system is one that helps to maintain organic-matter content and improves the moisture-holding capacity. An example of such a system is corn followed by a small grain and then 1 year or more of hay. Deep-rooted grasses and legumes grow moderately well, but bluegrass sod does not do well on this droughty soil.

CAPABILITY UNIT Vw-1

This unit consists of deep, well drained and moderately well drained, nearly level soils on bottom lands along most of the streams in the two counties. These soils are in the Moshannon and Senecaville series. Part of the acreage is flooded at least once every year, generally in spring and most of the acreage is subject to flooding 2 years out of 3. Areas near the mouth of small streams that empty into the Ohio River are frequently covered by backwater. These soils are moderate to high in natural fertility and are easily worked.

Because flooding is a hazard, these soils are not suited to row crops. Grass-legume mixtures are suitable for hay and pasture, but they may be damaged by flooding. Because these soils usually are flooded during the spring, there is less risk of losing new seedings if they are planted in August. Bluegrass grows well in most areas.

CAPABILITY UNIT VIe-1

This unit consists of deep to moderately deep, well drained and moderately well drained, steep soils that occur on ridgetops, benches, and dissected terraces. These soils are in the Brooke, Markland, and Upshur series. The soils are sticky and plastic. They are moderate to high in natural fertility and hold moisture well. These soils are difficult to work, but crops on them respond to good management. Some areas are severely eroded, and the hazard of erosion is very severe.

The soils in this unit are not suited to cultivated crops. They are suited to grass-legume mixtures grown for hay and pasture if properly managed. These soils should be plowed only when it is necessary to establish new stands. On long slopes reseeding in strips helps to control excessive runoff and erosion. In pastures bluegrass grows moderately well.

CAPABILITY UNIT VIe-2

This unit consists of deep to moderately deep, well drained and moderately well drained, steep soils on terraces and uplands. These soils are in the Allen, Monongahela, Muskingum, Tilsit, and Zoar series. Erosion has removed most of the original surface layer from these soils, and a few gall spots occur. These soils are low in natural fertility, particularly in potash. Crops on them respond to good management.

The soils in this unit are not suited to row crops because of the difficulty in maintaining fertility and controlling erosion on these severely eroded, steep soils. If these soils are properly managed, they are suited to pasture. Fields should be plowed only when it is necessary to establish new stands. Stripcropping on long slopes and contour cultivation should be used when these soils are seeded. In pastures bluegrass grows moderately well.

CAPABILITY UNIT VIe-3

This unit consists of deep to moderately deep, well-drained, steep soils on ridgetops, benches, and foot slopes throughout the two counties. These soils are in the Upshur, Muskingum, Brooke, and Vandalia series. Erosion has removed most of the original surface layer from these soils, and a few gall spots, slips, or gullies occur in some areas. Water and air move slowly through these soils. They are low to high in natural fertility and hold moisture fairly well. Crops on them respond well to good management. Runoff is excessive, and the hazard of erosion is very severe. Most areas are severely eroded.

The soils in this unit are not suited to row crops. If properly managed, they are suited to grasses and legumes. These soils should be plowed only when it is necessary to reseed or to establish new pasture. Contour cultivation and, on long slopes, contour strips should be used when these soils are seeded. In pastures bluegrass grows fairly well.

CAPABILITY UNIT VIs-1

Vandalia very stony silty clay loam, 20 to 30 percent slopes, is the only soil in this unit. It is a deep, well-drained soil that occurs on foot slopes scattered throughout the two counties, but its total acreage is small. This soil is high in natural fertility and holds moisture well.

Because this soil is stony and steep, it is not suited to cultivated crops or hay. Pasture is a suitable use, but it should not be overgrazed. In well-managed pastures, bluegrass grows well.

CAPABILITY UNIT VIs-5

Lakin loamy fine sand, 20 to 30 percent slopes, is the only soil in this unit. This deep, excessively drained soil developed in sandy material deposited by the wind. It occurs in hummocky and dunelike areas along the Ohio River. Water and air move rapidly through this soil, and it is extremely droughty in summer. This soil is low in natural fertility, particularly in potash.

This soil is too droughty and too steep for cultivation, and use for pasture is limited. Deep-rooted grasses and legumes grow better than bluegrass, but their growth generally is slow. This soil is poorly suited to bluegrass.

CAPABILITY UNIT VIIe-1

This unit consists of deep to moderately deep, well drained and moderately well drained, steep to very steep soils on hillsides, steep breaks between benches, foot slopes, and terrace escarpments. Steep land, alluvial materials, and soils of the Markland, Muskingum, Upshur, and Vandalia series are in this unit. These soils make up about a third of the acreage in the two counties. The Upshur and Muskingum soils are dominant. Most areas are severely eroded, and a few gall spots, slips, or gullies occur in some places. Permeability is slow to very slow. These soils are moderate in natural fertility and hold moisture fairly well. Runoff is excessive, and the hazard of erosion is very severe in unprotected areas.

These soils and land type are better suited to trees than to pasture, but they can be used for permanent pasture if grazing is limited and other management is good. Growing cultivated crops or hay is not feasible on these steep soils.

CAPABILITY UNIT VIIe-2

This unit consists of deep to moderately deep, well-drained, steep and very steep soils on uplands and in areas of wind-deposited material. These soils are in the Duncannon and Muskingum series. The Muskingum soils make up most of the acreage of this unit. They occur mostly in the vicinity of Volcano in Wood County, but occupy less extensive areas scattered throughout the two counties. Duncannon soils are on the hillsides facing the Ohio River. The hazard of erosion is severe in most areas.

The soils in this unit are too steep for cultivated crops and hay. They are better suited to trees, but they have limited use as permanent pasture. Maintaining fertility and a good sod are difficult on these soils, and care should be taken not to overstock or overgraze the pasture.

CAPABILITY UNIT VIIe-5

This unit consists of moderately deep to deep, steep to very steep soils on uplands and on foot slopes. These soils are in the Brooke, Muskingum, Upshur, and Vandalia series. These soils are very severely eroded, and water from adjoining slopes has accumulated in many areas. Bare, actively eroding spots, gullies, and landslips are common.

The soils in this unit are very difficult to manage and their use for crops, hay, or pasture is not feasible. They need the protection of woody plants. Water control measures are needed in many places for successful planting on these soils.

CAPABILITY UNIT VIIs-1

This unit consists of deep to moderately deep, well-drained, steep and very steep soils that are very stony. These soils occur mainly on bluffs along the major streams in the two counties. They are in the Muskingum, Upshur, and Vandalia series.

The soils in this unit are mostly wooded. They should be kept in trees because they are too stony and too steep to manage for pasture. They can be used as wildlife habitat.

Estimated Yields

Table 1 shows, for the arable soils in the two counties, the estimated average yields of the commonly grown crops and pasture plants. The estimates are those obtained under two levels of management and are shown under columns A and B. They are averages for a period of about 10 years. In any one year, yields may be higher or lower than the average because of favorable or bad weather. Some of the soils in Wood and Wirt Counties are not suited to crops or pasture and are not listed in table 1. These soils are steep or very steep, stony, or severely eroded.

The yields given in columns A of table 1 are those obtained under ordinary management, or management commonly practiced in the two counties. In this management, the practices used are not adequate for obtaining maximum production. Where available, crop yields from the records of farmers and others were used as a basis in estimating the yields given in columns A. Where information was lacking, estimates were made by considering the properties of the soils. Yields obtained from recent reports of the U.S. Census of Agriculture were also considered.

TABLE 1.—*Estimated average acre yields of principal crops*

[Yields in columns A are those expected under ordinary management; those in columns B are yields to be expected under improved management. Absence of yield indicates crop is not well suited at specified level of management. Soils that are severely limited by steep slopes, stoniness, or very severe erosion are considered not suitable for crops or pastures and do not appear in this table]

Soil	Corn		Wheat		Clover-grass		Alfalfa-grass		Permanent pasture	
	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Allen loam, 3 to 10 percent slopes	50	100	20	37	1.5	3.0	2.0	4.0	50	135
Allen loam, 10 to 20 percent slopes	45	90	18	35	1.3	2.8	1.8	3.8	45	130
Allen loam, 10 to 20 percent slopes, severely eroded	40	75	15	25	1.0	2.2	1.5	3.2	40	120
Allen loam, 20 to 30 percent slopes, severely eroded									35	110
Ashton silt loam, 0 to 3 percent slopes	80	120	27	45	2.5	3.5	3.0	5.0	90	170
Ashton silt loam, 3 to 10 percent slopes	80	120	27	45	2.5	3.5	3.0	5.0	90	170
Cotaco silt loam, 0 to 3 percent slopes	50	90	22	33	1.7	3.0	2.2	2.8	65	160
Cotaco silt loam, 3 to 10 percent slopes	50	90	22	33	1.7	3.0	2.2	3.0	65	160
Cotaco silt loam, 10 to 20 percent slopes	55	75	20	30	1.2	2.8	2.1	3.0	60	150
Duncannon silt loam, 3 to 10 percent slopes	60	95	22	35	1.5	3.0	2.5	4.0	65	155
Duncannon silt loam, 10 to 20 percent slopes	55	90	20	32	1.5	2.7	2.2	3.8	65	155
Duncannon silt loam, 20 to 30 percent slopes	50	85	18	30	1.3	2.3	2.0	3.5	60	150
Duncannon silt loam, 30 to 40 percent slopes									50	140
Ginat silt loam		85		25		2.5			50	80
Hackers loam, 0 to 3 percent slopes	70	110	20	40	2.2	3.2	2.8	4.5	90	165
Hackers loam, 3 to 10 percent slopes	70	110	20	40	2.2	3.2	2.8	4.5	90	165
Hackers loam, 10 to 20 percent slopes	65	105	18	37	1.7	2.7	2.5	4.0	80	160
Hackers silt loam, 0 to 3 percent slopes	80	120	22	45	2.5	3.5	3.0	5.0	90	170
Hackers silt loam, 3 to 10 percent slopes	80	120	22	45	2.5	3.5	3.0	5.0	90	170
Hackers silt loam, 10 to 20 percent slopes	75	115	20	40	2.3	3.3	2.7	4.7	80	165
Hackers silt loam, 20 to 30 percent slopes	65	105	18	36	2.0	3.0	2.2	4.0	75	160
Huntington fine sandy loam	70	110	22	42	2.0	3.2	2.5	4.5	100	160
Huntington silt loam, 0 to 3 percent slopes	80	120	27	45	2.5	3.5	3.0	5.0	90	170
Huntington silt loam, 3 to 10 percent slopes	80	120	27	45	2.5	3.5	3.0	5.0	90	170
Huntington silt loam, low bottom	65	105	20	40						
Lakin loamy sand, 3 to 10 percent slopes	40	75	17	32	1.2	2.0	1.7	3.0	40	60
Lakin loamy fine sand, 3 to 10 percent slopes	35	70	15	30	1.2	2.0	1.7	2.5	40	60
Lakin loamy fine sand, 10 to 20 percent slopes	30	50	15	30	1.0	1.7	1.5	2.5	35	50
Lindside silt loam	70	105	20	40	2.0	3.2	2.5	3.7	85	160
Markland silt loam, 3 to 10 percent slopes	40	80	20	30	1.8	3.0	2.0	3.5	70	140
Markland silt loam, 10 to 20 percent slopes	35	75	18	27	1.5	2.7	1.7	3.2	60	135
Markland silty clay loam, 10 to 20 percent slopes, severely eroded	30	65	16	25	1.2	2.5	1.4	3.0	55	130
Markland silty clay loam, 20 to 30 percent slopes, severely eroded									50	125
McGary silty clay loam		85		30	1.7	2.7			65	125
Melvin silt loam		85		32	1.2	2.7			70	140
Monongahela and Tilsit silt loams, 0 to 3 percent slopes	40	80	20	30	1.5	2.8	2.0	2.7	50	135
Monongahela and Tilsit silt loams, 3 to 10 percent slopes	40	85	20	32	1.3	3.0	2.0	3.0	50	145
Monongahela and Tilsit silt loams, 10 to 20 percent slopes	35	80	18	30	1.3	2.8	2.0	3.0	50	135
Monongahela and Tilsit silt loams, 10 to 20 percent slopes, severely eroded	30	70	15	25	.8	2.2	1.8	2.5	45	125
Monongahela and Tilsit silt loams, 20 to 30 percent slopes	30	70	15	25	.8	2.2	1.8	2.5	40	120
Monongahela and Tilsit silt loams, 20 to 30 percent slopes, severely eroded									35	115
Moshannon silt loam, 0 to 3 percent slopes	70	100	25	42	2.0	3.0	2.3	4.2	85	165
Moshannon silt loam, 3 to 10 percent slopes	70	100	25	42	2.0	3.0	2.3	4.2	85	165
Moshannon silt loam, low bottom									70	130
Moshannon silt loam, coarse subsoil variant	60	90	22	38	1.8	2.8	2.2	3.8	80	155
Muskingum silt loam, 10 to 20 percent slopes	42	70	17	30	1.0	2.5	1.3	3.2	50	125
Muskingum silt loam, 10 to 20 percent slopes, severely eroded	40	65	15	25	.8	2.2	1.0	3.0	45	115
Muskingum silt loam, 20 to 30 percent slopes	40	60	15	30	.8	2.5	1.0	3.2	45	115
Muskingum silt loam, 20 to 30 percent slopes, severely eroded									40	100
Sciotoville silt loam, 0 to 3 percent slopes	65	85	25	35	1.7	3.0	2.0	2.8	80	155
Sciotoville silt loam, 3 to 10 percent slopes	65	90	25	37	1.7	3.2	2.2	3.0	80	155
Senecaville silt loam	70	105	20	40	2.0	3.2	2.5	3.7	85	160
Senecaville silt loam, low bottom									70	145
Tygart silt loam		85		27	1.5	2.5			60	120
Upshur silty clay loam, 3 to 10 percent slopes	55	80	15	27	1.5	3.0	2.5	4.0	80	140
Upshur silty clay loam, 10 to 20 percent slopes	50	75	15	25	1.2	2.8	2.2	3.8	75	135
Upshur silty clay loam, 20 to 30 percent slopes	45	65	13	25	1.0	2.5	2.0	3.5	70	130

See footnote at end of table.

TABLE 1.—*Estimated average acre yields of principal crops*—Continued

Soil	Corn		Wheat		Clover-grass		Alfalfa-grass		Permanent pasture	
	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Upshur silty clay, 10 to 20 percent slopes, severely eroded	45	60	13	22	1.0	2.5	2.0	3.2	70	130
Upshur silty clay, 20 to 30 percent slopes, severely eroded	------	------	------	------	------	------	------	------	60	120
Upshur-Brooke silty clay loams, 10 to 20 percent slopes	50	75	15	25	1.2	2.8	2.2	3.8	75	135
Upshur-Brooke silty clay loams, 20 to 30 percent slopes	45	65	13	25	1.0	2.5	2.0	3.5	70	130
Upshur-Brooke silty clays, 10 to 20 percent slopes, severely eroded	45	60	13	22	1.0	2.5	2.0	3.2	70	130
Upshur-Brooke silty clays, 20 to 30 percent slopes, severely eroded	------	------	------	------	------	------	------	------	60	120
Upshur-Muskingum complex, 3 to 10 percent slopes:										
Upshur soil	55	80	15	27	1.5	3.0	2.5	4.0	80	140
Muskingum soil	------	------	------	------	------	------	------	------	------	------
Upshur-Muskingum complex, 10 to 20 percent slopes:										
Upshur soil	50	75	15	25	1.2	2.8	2.2	3.8	75	135
Muskingum soil	42	70	17	30	1.0	2.5	1.3	3.2	50	125
Upshur-Muskingum complex, 10 to 20 percent slopes, severely eroded:										
Upshur soil	45	60	13	22	1.0	2.5	2.0	3.2	70	130
Muskingum soil	40	65	15	25	.8	2.2	1.0	3.0	45	115
Upshur-Muskingum complex, 20 to 30 percent slopes:										
Upshur soil	45	65	13	25	1.0	2.5	2.0	3.5	70	130
Muskingum soil	40	60	15	30	.8	2.5	1.0	3.2	45	115
Upshur-Muskingum complex, 20 to 30 percent slopes, severely eroded:										
Upshur soil	------	------	------	------	------	------	------	------	60	120
Muskingum soil	------	------	------	------	------	------	------	------	40	100
Vandalia silty clay loam, 3 to 10 percent slopes	50	90	20	35	1.2	3.2	2.5	4.2	80	160
Vandalia silty clay loam, 10 to 20 percent slopes	45	85	17	32	1.0	3.0	2.2	4.0	75	155
Vandalia silty clay loam, 10 to 20 percent slopes, severely eroded	40	75	15	27	.8	2.7	2.0	3.5	70	150
Vandalia silty clay loam, 20 to 30 percent slopes	40	80	15	30	.8	3.0	2.0	3.8	70	150
Vandalia silty clay loam, 20 to 30 percent slopes, severely eroded	------	------	------	------	------	------	------	------	60	145
Vandalia silty clay loam, 30 to 40 percent slopes	------	------	------	------	------	------	------	------	55	140
Vandalia very stony silty clay loam, 20 to 30 percent slopes	------	------	------	------	------	------	------	------	75	120
Vandalia very stony silty clay loam, 30 to 40 percent slopes	------	------	------	------	------	------	------	------	75	120
Wheeling fine sandy loam, 0 to 3 percent slopes	65	100	20	40	2.0	3.0	2.7	4.0	70	140
Wheeling fine sandy loam, 3 to 10 percent slopes	65	100	20	37	2.0	2.8	2.7	4.0	70	140
Wheeling fine sandy loam, 10 to 20 percent slopes	60	90	18	32	1.7	2.5	2.5	3.7	65	135
Wheeling silt loam, 0 to 3 percent slopes	70	110	20	42	2.0	3.2	2.7	4.5	100	160
Wheeling silt loam, 3 to 10 percent slopes	70	110	20	40	2.0	3.0	2.7	4.5	100	160
Wheeling silt loam, 10 to 20 percent slopes	65	95	18	35	1.7	2.7	2.5	4.2	90	155
Zoar silt loam, 3 to 10 percent slopes	50	80	20	30	1.3	3.0	2.2	3.2	50	130
Zoar silt loam, 10 to 20 percent slopes	45	75	17	27	1.3	2.8	2.2	3.2	45	125
Zoar silty clay loam, 10 to 20 percent slopes, severely eroded	40	70	15	25	.8	2.2	1.7	2.5	40	120
Zoar silty clay loam, 20 to 30 percent slopes, severely eroded	------	------	------	------	------	------	------	------	35	110

[1] Cow-acre-days is a term used to express the carrying capacity of pasture. It is the number of animal units carried per acre multiplied by the number of days the pasture is grazed during a single grazing season without injury to the sod. An acre of pasture that provides 30 days of grazing for two cows has a carrying capacity of 60 cow-acre-days.

The estimated yields shown in columns B are those that can be expected for the best management practical, including the addition of proper kinds and amounts of fertilizer. These yields are not the maximum yields obtainable. Larger applications of fertilizer and more intensive management practices may result in increased yields. Yields higher than those shown in columns B may result from new techniques, but the relative response of the different soils is not likely to change much. The yields shown in columns B are based on the results of corn and alfalfa trials made by the West Virginia Agricultural Experiment Station and on actual experiences of farmers using the best management.

When data was lacking for yields shown in columns A and columns B, estimates were made by using data obtained from similar soils in adjacent counties.

The management needed to obtain yields shown in columns B includes liming to the pH required for the crop, fertilizing according to needs determined by soil tests, using good rotations, good pasture management, and using the necessary soil and water conservation practices, including adequate drainage where needed.

Comparing the yields in columns B with those in columns A indicates the response expected under improved management. Crops on deep, well-drained soils that have good available moisture capacity generally show the best response. The response of crops to improved management is limited on soils that are high in natural fertility but are fine textured and slowly permeable. The increase in yields obtained under improved management is commonly greater for pasture than for cultivated crops, because under ordinary management cultivated crops generally receive more lime and fertilizer than does pasture.

Use of Soils as Woodland [1]

Woodland in Wood and Wirt Counties occupies 269,696 acres, or about 70 percent of the total land. Wooded areas are extensive in the vicinity of Volcano in Wood County and near Rock Run and in the areas between Creston and Spring Creek in Wirt County. In addition, there are some large and small tracts of woodland scattered throughout the two counties.

The woodland in Wood and Wirt Counties occurs mainly on the soils of the Upshur and Muskingum complexes. Also important as woodland are other Muskingum soils and the Vandalia, Monongahela, and Tilsit soils. Much of the acreage of the Vandalia, Upshur, and Muskingum soils was once cleared, and most of it was used for pasture. Almost all of the acreage of the Monongahela and Tilsit soils that is now in stands of Virginia pine and shortleaf pine was formerly cleared for farming. Little woodland now occurs on the soils on bottom lands and on low terraces.

Soil properties have a strong influence on species adaptation, tree growth, and woodland management practices. Differences in the depth and texture of the soil material, for example, affect the available moisture capacity and thereby influence the growth of trees. Other features, such as slope and aspect, or the direction a slope faces, also account for differences in the growth of trees and in the management of the stand.

Forest types

In Wood and Wirt Counties, the major forest types are the oak-hickory, the maple-beech-birch, and the Virginia pine-shortleaf pine-pitch pine. These major forest types account for about 87 percent of the wooded acreage. The remaining 13 percent of the woodland is made up of other hardwood types.

Oak-hickory.—This forest type makes up about 60 percent of the total woodland. It consists of forests in which 50 percent or more of the stand is upland oaks or hickory. Common associates include yellow-poplar, basswood, and other hardwoods growing in coves. This forest type occurs on uplands and is widely distributed throughout the two counties. The most important commercial trees are in this forest type.

Maple-beech-birch.—This major forest type makes up about 17 percent of the woodland (*4*).[2] It consists of stands that are 50 percent or more maple and beech. The trees grow singly or in combination. This forest type occurs on uplands, mainly in coves and on north-facing and south-facing slopes.

Virginia pine-shortleaf pine-pitch pine.—This type accounts for about 10 percent of the wooded acreage. The stand in this forest type consists mostly of Virginia pine (fig. 5). This forest type occurs mainly in old fields on uplands and on terraces.

Woodland suitability groups

Some of the soils in Wood and Wirt Counties have been grouped according to those characteristics that affect the growth of trees and management of the stand. Each group is made up of soils that have about the same suitability for wood crops, that require about the same management, and that have about the same potential productivity. The names of soil series represented are given in the description of each woodland suitability group, but this does not mean that all of the soils in a given series appear in the group. Soils that are now used for crops and pasture have not been placed in a woodland suitability group. Information about the use of these soils for trees can be obtained from the local representative of the Soil Conservation Service. The soils in each woodland suitability group can be identified by referring to the "Guide to Mapping Units" at the back of this soil survey.

The woodland suitability groups are described in this section. Given for each group are the trees generally preferred in the management of natural stands, the trees preferred for planting, the site index for specified trees, and some limitations and hazards that affect management. The terms used in the descriptions of these groups are explained in the following paragraphs.

Productivity is expressed as *site index* and as average yearly growth. A site index for a given soil is the height, in feet, that a specified kind of tree growing on that soil will reach in 50 years. The site indexes for the woodland suitability groups were estimated and are given as a range, for example, 75 to 84. They are based on data obtained by measuring the height and age of certain trees growing on a number of the soils in Wood and Wirt Counties or in nearby counties (fig. 6).

The average yearly growth, expressed in board feet per acre, is calculated from the average site index. For oaks and yellow-poplar, it is the annual averages to 50 years of age. For Virginia pine, it is the annual averages to 30 years of age.

Although white pine occurs in natural stands on some of the soils in these two counties, it is not common. It is, however, suitable for planting. The site index for white pine can be estimated by adding 10 feet to the indexes given for oaks or for Virginia pine growing on the same or similar soils. The potential yields of white pine planted on soils that have a site index of 65 or more can be estimated by using data given in the Southeastern Forest Experiment Station Paper No. 149 (*14*).

Aspect, or the direction that a slope faces, affects site quality, species suitability, plant competition, and seedling mortality, on some of the soils in Wood and Wirt Counties. Aspect is shown as north or south. Slopes that face north or east of a line drawn from true northwest to true southeast have a north aspect; those that face south or west of this line have a south aspect. Aspect

[1] Ross H. Mellinger, woodland conservationist, Soil Conservation Service, helped to prepare this section.

[2] Italicized numbers in parenthesis refer to Literature Cited, p. 77.

Figure 5.—**A well-stocked stand of Virginia pine about 35 years old. The soil is a Tilsit silt loam.**

can be determined by examining the photographic background of the detailed soil map at the back of this soil survey, by using a topographic map, by using a stereoscope and a pair of plain photographs of a given area, or by examining the site.

On the soils of each woodland group are varying degrees of hazards and limitations that affect management. These limitations are rated *slight*, *moderate*, or *severe*, as explained in the following paragraphs.

Plant competition refers to the effect that invading brush, grass, vines, and other undesirable plants have on the natural or artificial establishment and the early growth of desirable seedlings. Competition is *slight* if unwanted plants do not prevent adequate regeneration or do not interfere with the early growth of natural or planted seedlings. It is *moderate* if the invaders delay but do not prevent the establishment of well-stocked stands. Planted seedlings may require some site preparation and some release from unwanted plants after establishment. Competition is *severe* if undesirable plants prevent adequate natural or artificial regeneration, unless there is intensive site preparation and generally more than one release by chemical or mechanical weeding.

Equipment limitation caused by unfavorable soil characteristics and topographic features, such as internal drainage, texture, and number and size of stones may restrict or prohibit the use of equipment that is commonly used in woodland management. The limitation is *slight* if there is little or no restriction as to kind of equipment or time of year that equipment is used. In places where the slope is the main limitation, it is generally less than 15 percent. The limitation is *moderate* if the use of equipment is restricted for less than 3 months a year or if slopes generally range from 15 to 35 percent. It is *severe* if the use of equipment is prohibited for more than 3 months a year, if special equipment is needed, if large or

Figure 6.—**Measuring the height and age of Virginia pine to determine the site index. The soil is an Upshur silty clay loam.**

numerous stones seriously interfere with cultural and harvesting work, or if slopes are more than 35 percent.

Erosion hazard is rated according to the risk of gully erosion when the woodland is managed or trees are harvested. The hazard generally is related to the layout, construction, and maintenance of roads and skid trails. The rating is *slight* if no special practices are needed. It is *moderate* if some practices, such as those for frequently diverting water from roads and skid trails are necessary. The erosion hazard is *severe* if intensive practices are needed to prevent erosion. Where the hazard is severe, extreme care must be taken in locating, laying out, and constructing roads and skid trails. Also, special care is needed in diverting water during and after logging and, in some places, grasses must be seeded.

Seedling mortality refers to the expected losses of naturally occurring or planted seedlings that are a result of unfavorable soil characteristics or topographic features, but not as a result of plant competition. Mortality is *slight* if less than 25 percent of the seedlings are expected to die and is *moderate* if this percentage is between 25 and 50. Mortality is *severe* if more than 50 percent of the seedlings are expected to die, but seedling mortality is not rated severe for any of the soils in the two counties.

The seven woodland suitability groups in Wood and Wirt Counties are described in the following pages. Some of the soils in these two counties have not been placed in a woodland group because they are now used for crops and pasture, or for purposes other than woodland. Information about the management of these soils as woodland can be obtained from the local office of the Soil Conservation Service.

WOODLAND SUITABILITY GROUP 1

This group consists of deep, well-drained, gently sloping to steep soils that occur on foot slopes and are severely eroded or are susceptible to severe erosion. Also, they are susceptible to slippage, and a small acreage is stony. These soils are in the Vandalia series. They developed in colluvium washed mainly from upland areas of

Upshur and Muskingum soils. Surface runoff is rapid, and available moisture capacity is moderate. Permeability is slow.

In managing these soils for woodland, practices are needed to offset the effects of the clayey texture and to control erosion and landslips. Other concerns are the runoff from higher slopes and the small seeps that occur in places.

Among the trees preferred for sawtimber growing in natural stands are red oak, black oak, white oak, yellow-poplar, and black walnut. Virginia pine grows in many of the formerly cultivated fields.

White pine and Virginia pine are preferred for planting, but yellow-poplar, black walnut, and black locust are also suitable. Scotch pine, white pine, and Norway spruce are preferred for Christmas trees; they can be grown on nonstony soils having slopes of not more than 30 percent.

For upland oaks, the site index ranges from 65 to 74 and the potential average yearly growth is about 175 board feet per acre. For yellow-poplar, the site index ranges from 75 to 84 and the average yearly growth is about 320 board feet per acre. For Virginia pine, the site index ranges from 65 to 74 and the average yearly growth is about 1 cord per acre.

Competition from brushy hardwoods is severe for pines that are planted or that regenerate naturally. In old fields grasses, weeds, and black locust severely compete with planted trees. Careful preparation of the site and intensive weedings are necessary where pines are planted.

The use of logging and hauling equipment is severely limited in winter and early in spring when the soils are wet. Because of the clayey, sticky subsoil and the many seep spots, equipment bogs down unless the ground is deeply frozen.

Because the erosion hazard is severe and slippage is likely, it is essential that roads and skid trails are carefully located on gentle grades and that deep cuts are avoided where possible. Also, diverting water from the roads and skid trails is important.

Seedling mortality is only slight on these soils.

WOODLAND SUITABILITY GROUP 2

This group consists of deep, moderately well drained, nearly level to steep soils on terraces and uplands. These soils are in the Cotaco, Markland, Monongahela, Tilsit, and Zoar series. Some are severely eroded. Their subsoil contains a fragipan or a clayey layer that is slowly permeable. Surface runoff is moderate, and available moisture capacity generally is moderate.

In managing these soils for woodland, practices are needed to lower the seasonal high water table.

Among the trees preferred in natural stands are red oak, black oak, yellow-poplar, white pine, Virginia pine, and shortleaf pine. Pines grow in many of the formerly cultivated fields.

White pine and Virginia pine are preferred for planting. Scotch pine, white pine, and Norway spruce are preferred for Christmas trees.

For upland oaks, the site index ranges from 65 to 74 and the potential average yearly growth is about 175 board feet per acre. For yellow-poplar, the site index ranges from 75 to 84 and the average yearly growth is about 320 board feet per acre. For Virginia pine, the site index ranges from 65 to 74 and the average yearly growth is about 1 cord per acre.

Plant competition is only slight for hardwoods but generally is moderate for pines. Brushy hardwoods generally invade these areas after the pines are harvested. Preparation of the site reduces the competition from grasses where trees are planted in formerly cultivated, fertilized fields.

The use of logging and hauling equipment is severely limited in winter and early in spring when the soils are wet. Summer and early in fall are best times for logging.

The hazard of erosion is moderate where roads are built. Roads and skid trails, however, are needed in only a few places because these soils are gently sloping.

Seedling mortality is generally slight on these soils.

WOODLAND SUITABILITY GROUP 3

This group consists of moderately deep, well-drained, strongly sloping to very steep soils on uplands. These soils are in the Muskingum series. They developed on acid, interbedded sandstone and shale. These soils occur in coves at the heads of streams, on hillsides, and on benches, and they are extensive in the vicinity of Volcano in Wood County. They have moderate to moderately rapid permeability and moderate available moisture capacity, and they are slightly droughty in summer. Surface runoff is moderate in most areas.

The main factor to consider when planning woodland management on these soils is the steepness of the slope.

The suitability of the site and of the tree species is strongly affected by aspect, or the direction in which a slope faces, and by the influence of the sheltered coves.

On north-facing slopes and in coves, yellow-poplar, basswood, sugar maple, red oak, black walnut, and white ash are among the trees preferred for sawtimber growing in natural stands. White pine and yellow-poplar, and, in coves, black walnut are preferred for planting. White pine, Scotch pine, and Norway spruce are preferred for Christmas trees; they can be grown on nonstony soils having slopes of not more than 30 percent.

On south-facing slopes and on ridgetops, black oak and white oak are preferred for sawtimber growing in natural stands, but chestnut oak, scarlet oak, red maple, and hickory are also suitable. Virginia pine is preferred for pulpwood.

White pine and Virginia pine are preferred for planting. White pine and Scotch pine are preferred for Christmas trees; they can be grown on nonstony soils having slopes of not more than 30 percent.

On north-facing slopes, the site index for upland oaks ranges from 75 to 84 and the potential average yearly growth is about 250 board feet per acre. For yellow-poplar, the site index ranges from 85 to 95 and the average yearly growth is about 440 board feet per acre. On south-facing slopes, the site index for upland oaks ranges from 55 to 64 and the potential average yearly growth is about 115 board feet per acre. For Virginia pine, the site index ranges from 55 to 64 and the average yearly growth is about 0.6 cord per acre.

Plant competition is only slight for hardwoods, but competition from brushy hardwoods is severe for pines, especially on the north-facing slopes. Intensive weedings are necessary where pines are planted.

The use of equipment is limited mainly by the slope. The limitation ranges from slight to severe, depending on the degree of the slope.

Because the hazard of erosion is moderate and slippage is likely, it is necessary that steep grades and deep cuts are avoided when roads and skid trails are built.

Seedling mortality generally is slight on these soils.

WOODLAND SUITABILITY GROUP 4

This group consists of deep, well-drained, gently sloping to steep soils that commonly occur on ridges, saddles, and knolls throughout the two counties. These soils are severely eroded or are susceptible to severe erosion. They are in the Upshur series, and they developed on limy, clay shale. These soils are slowly permeable, and they are plastic and sticky when wet. Surface runoff is rapid, and available moisture capacity is moderate.

In managing these soils for woodland, practices are needed to offset the effects of the clayey texture of the subsoil and to control erosion.

On the soils in this group, aspect, or the direction in which a slope faces, strongly affects suitability of the site and of the tree species. It also affects plant competition.

On north-facing slopes, among the trees preferred for sawtimber growing in natural stands are yellow-poplar, red oak, black oak, and black walnut. Pines grow in some of the formerly cultivated fields. White pine and Virginia pine are preferred for planting on the north-facing slopes, but yellow-poplar, black walnut, and black locust are also suitable. Scotch pine, white pine, and Norway spruce are preferred for Christmas trees on soils having slopes of not more than 30 percent.

On south-facing slopes and on ridgetops, among the trees preferred in natural stands are black oak, white oak, shortleaf pine, and Virginia pine. White pine and Virginia pine are preferred for planting. White pine and Scotch pine are preferred for Christmas trees on soils having slopes of not more than 30 percent.

On north-facing slopes, the site index for upland oaks ranges from 65 to 74 and the potential average yearly growth is about 175 board feet per acre. For yellow-poplar, the site index is 75 to 84 and the average yearly growth is about 320 board feet per acre. For Virginia pine, the site index is 65 to 74 and the average yearly growth is about 1 cord per acre. On south-facing slopes, the site index for upland oaks and Virginia pine ranges from 55 to 64. The potential yearly growth is about 100 board feet per acre for oaks and is about 0.6 cord per acre for Virginia pine.

For pines, the competition from invading hardwoods is severe on north-facing slopes and is moderate on south-facing slopes. Where pines are grown, more intensive weedings are generally needed on the north-facing slopes than on the south-facing slopes. In old fields invading grasses, weeds, and black locust generally severely compete with planted trees. Careful preparation of the site is needed where trees are planted.

The use of equipment is severely limited in winter and early in spring because the soils are wet. Even in summer the use of equipment is limited in wet weather. The use of equipment is further limited by the steepness of the slope in some areas.

The hazard of erosion is severe, and landslips occur in some of the steeper areas if deep cuts are made. Care is needed in locating and constructing roads and skid trails so that grades are gentle and deep cuts are avoided. Also, seeding grasses and diverting water from the roads and skid trails are important.

Seedling mortality is generally slight on these soils. It is moderate, however, in the severely eroded areas on the south-facing slopes or on the ridgetops.

WOODLAND SUITABILITY GROUP 5

This group consists of moderately deep and deep, strongly sloping to steep soils that occur on hillsides and benches and in coves at the head of many small streams. These soils are very severely eroded or are susceptible to severe erosion. Also, they are susceptible to slippage, and a small acreage is stony. These soils are in the Brooke, Muskingum, and Upshur series. They developed on interbedded shale and sandstone. Areas that are made up of closely intermingled Upshur and Muskingum soils are dominant. Most of the soils in this group are sticky, plastic, and slowly permeable. Runoff is moderate to rapid, and available moisture capacity generally is moderate.

In managing these soils for woodland, practices are needed to offset the effects of the slope, the clayey texture of the subsoil, and to control erosion and landslips.

On the soils in this group, site quality, species suitability, and plant competition are strongly affected by aspect, or the direction in which a slope faces, and by the coves.

On north-facing slopes and in coves, among the trees preferred for sawtimber growing in natural stands are yellow-poplar, basswood, sugar maple, red oak, black walnut, white ash. The better sites are in the coves. White pine, yellow-poplar, and black walnut are preferred for planting. White pine, Scotch pine, and Norway spruce are suitable for Christmas trees; they can be grown on nonstony soils having slopes of not more than 30 percent.

On south-facing slopes and ridgetops, pines are more suitable commercially than are hardwoods. In natural stands, Virginia pine, shortleaf pine, and pitch pine are preferred, but white oak and black oak are also suitable. White pine and Virginia pine are preferred for planting. Scotch pine and white pine are preferred for Christmas trees; they can be grown in nonstony areas having slopes of not more than 30 percent.

On north-facing slopes, the site index for upland oaks ranges from 70 to 85 and the potential average yearly growth is 200 board feet or more per acre. For yellow-poplar, the site index ranges from 85 to 105 and the average yearly growth is 500 board feet or more per acre. On south-facing slopes, the site index for upland oaks and Virginia pine ranges from 55 to 64. The potential average yearly growth is about 115 board feet per acre for oaks and 0.6 cord per acre for Virginia pine.

Competition from hardwoods is severe for pines that are planted or that regenerate naturally on north-facing slopes and in coves. It is moderate for pines growing on south-facing slopes. Where pines are grown, more intensive weedings generally are needed on north-facing slopes than on south-facing slopes. In old fields black locust, grasses, and weeds severely compete with planted trees. Careful preparation of the site is necessary where pines are planted.

The use of logging and hauling equipment is severely limited in winter and early in spring, and even in summer when the soils are wet (fig. 7). The use of equipment is also limited by the slope.

Because the erosion hazard is severe and slippage is likely, it is essential that roads and skid trails are carefully located on gentle grades, that deep cuts are avoided, where possible, and that water is diverted from the roads and trails. Seeding grasses is needed in some places to help control erosion.

Seedling mortality generally is slight on these soils, but is moderate on the severely eroded soils that have south-facing slopes or that are on ridgetops.

WOODLAND SUITABILITY GROUP 6

This group consists of moderately deep, steep to very steep soils that occur on uplands and are severely eroded. These soils are in the Brooke, Muskingum, and Upshur series. They occupy many small areas throughout the two counties. Surface runoff is rapid, and available moisture capacity is low to moderate. Gullies, landslips, and bare, eroded areas are common.

In managing these soils for woodland, practices are needed to offset the effects of the clayey texture and droughtiness and to control erosion and landslips.

Virginia pine is preferred in natural stands and also for planting. White pine and shortleaf pine are also suitable for planting. If erosion control is the main objective, black locust is suitable for planting.

For Virginia pine, the site index ranges from 55 to 64 and the potential average yearly growth is about 0.6 cord per acre.

Figure 7.—**This woodland road is on an Upshur-Muskingum silty clay loam, which is in woodland suitability group 5. The use of equipment is severely limited on these soils in winter and early in spring.**

Competition from hardwoods is only slight for pines that are planted or that regenerate naturally.

The use of logging and hauling equipment is severely limited because the soils are steep and gullied and are sticky and plastic when wet.

Because the erosion hazard is severe, it is essential that roads and skid trails are carefully located and that water is diverted from the roads and trails. Seeding grasses is also important in some places.

Seedling mortality is moderate for trees that are planted or that regenerate naturally. Some seedlings are lost through active erosion, and some are lost late in spring or in summer where the top 4 inches of soil dries out. Where pines are planted, seedling losses can be reduced by diverting water and mulching the critical areas.

WOODLAND SUITABILITY GROUP 7

This group consists of deep, well-drained to somewhat poorly drained, nearly level to gently sloping soils that occur on long, narrow bottom lands along the smaller streams in the two counties. These soils are in the Moshannon and Senecaville series. They developed in alluvium or colluvium washed from soils on uplands, mainly Upshur and Muskingum soils. Permeability is moderate to moderately slow, and the available moisture capacity is high. Some areas in this group are flooded occasionally and some are flooded frequently.

On these soils, almost all of the acreage has been cleared and is used for pasture and crops, but a few stands of yellow-poplar, sycamore, and Virginia pine grow in some of the areas that are frequently flooded. Planting generally is necessary for desired species. Among the trees preferred for planting are yellow-poplar, black walnut, and white pine. Scotch pine, white pine, and Norway spruce can be grown for Christmas trees. These soils, however, are not well suited to Christmas trees of high quality because of flooding and the competition from grasses and weeds.

For upland oaks, the site index ranges from 75 to 84 and the potential average yearly growth is about 250 board feet per acre. For yellow-poplar, the site index ranges from 85 to 100 and the potential average yearly growth is about 500 board feet per acre.

Competition from annual weeds and grasses is severe. Preparation of the site and mowing generally are needed.

The use of logging and hauling equipment is severely limited in winter and early in spring when the water table is high.

The hazard of erosion ranges from slight to severe. It is severe in areas that are frequently flooded by water from slopes above.

Seedling mortality is only slight on these soils.

Yield data

Table 2 gives the total yields of upland oaks, yellow-poplar, and Virginia pine in fully stocked, natural stands. Yield tables are not available for the dominant trees that make up the maple-beech-birch forest type. For these trees, however, the site indexes and the yields per acre are assumed to be about the same as those for upland oaks.

The data from upland oaks and yellow-poplar were adapted from the USDA Technical Bulletins 560 (7) and

356 (*6*), respectively. The merchantable volume, expressed in board feet, for upland oaks and yellow-poplar were calculated according to the ¼-inch International rule to a top diameter of 5 inches, inside bark. These values were computed by reducing values of the ⅛-inch International rule by 9.5 percent and then rounding these off to the nearest 100 board feet.

For upland oaks, the merchantable volume given in cords is standard rough cords, including bark, to a top diameter of 4 inches, outside bark. These values were rounded off to the nearest whole cord.

In table 2, the values given in merchantable board feet and in cords for site index 90 were extrapolated for upland oaks. For yellow-poplar, the values shown in cords are for standard rough cords, including bark, to a top diameter of 3 inches, inside bark. These values were computed in cubic feet from peeled volume of all trees 5 inches or more in diameter at breast height. A converting factor of 86.4 cubic feet per cord was used, and the results were rounded off to the nearest whole cord.

The data for Virginia pine were adapted from the Southeastern Forest Experiment Station Paper No. 124 (*13*). The values were based on fully stocked stands (100 percent density) and were computed by using a converting factor of 85 cubic feet per standard cord. The values are for all merchantable stems 4 inches or more in diameter at breast high and to a top diameter of 4 inches, outside bark. The values for site index 50 were extrapolated for Virginia pine.

TABLE 2.—*Yields from upland oaks, yellow-poplar, and Virginia pine in fully stocked, natural stands*

Site index	Age of stand	Merchantable volume				
		Upland oaks		Yellow-poplar		Virginia pine
	Years	*Board feet*	*Cords*	*Board feet*	*Cords*	*Cords*
50	30	300	6			13
	40	1, 300	13			19
	50	2, 900	19			22
	70	7, 400	30			
60	20					
	30	800	10	900	8	19
	40	2, 900	19	2, 400	15	27
	50	5, 700	26	5, 100	21	31
	70	11, 600	39			
70	20			600	7	
	30	1, 600	15	2, 400	15	33
	40	5, 000	25	5, 100	23	46
	50	8, 800	33	10, 300	31	57
	70	16, 000	47			
80	20			1, 100	10	
	30	3, 000	20	4, 900	21	57
	40	7, 800	31	10, 200	31	79
	50	12, 400	41	16, 000	41	93
	70	21, 000	56			
90	20			1, 800	13	
	30	4, 600	24	7, 800	27	
	40	10, 800	37	14, 800	39	
	50	16, 000	48	22, 100	52	
	70	26, 200	65			
100	20			3, 100	17	
	30			11, 000	32	
	40			19, 600	47	
	50			29, 100	62	
	70					

Use of Soils for Wildlife

The wildlife common in the two counties are cottontail rabbit, gray squirrel, white-tailed deer, bobwhite quail, ruffed grouse, mourning dove, and various waterfowl. The numbers of these kinds of wildlife can be increased and other desirable species introduced, because many areas in the two counties are suitable for intensive use by many kinds of wildlife. This increase in wildlife is needed, for the expansion of industry has brought an increase in population and an increase in the need for recreation.

In this section the two counties have been divided into four wildlife areas, and these areas and their wildlife are described. Also, soils and land types in the two counties are rated according to their relative suitability for elements of wildlife habitat and for kinds of wildlife. The section "Recreational and Nonfarm Uses of Soils" gives information about use of the soils for access roads, buildings, impoundments, and other structures that may be needed in developing areas for wildlife.

Wildlife habitat areas

The soils in Wood and Wirt Counties have been grouped in four wildlife habitat areas, each containing one or more soil associations. The soil associations are shown on the colored map at the back of this survey and are described in the section "General Soil Map."

The four wildlife habitat areas are described in the following pages.

WILDLIFE HABITAT AREA 1

This area consists of the Huntington-Ashton-Wheeling and the Markland-McGary-Cotaco-Hackers soil associations. The soils in these associations are on bottom lands and terraces along the Ohio and the Little Kanawha Rivers. These soils are mainly nearly level to gently sloping. The fertile Ashton, Hackers, and Huntington soils are on bottom lands, and the Wheeling, Markland, McGary, and Cotaco soils are on the terraces.

Much of this wildlife area is used for housing and industrial development. The remaining farmland is mostly open, but there are a few widely scattered woodlots. Small grains and corn and hay and pasture plants are grown on most of the farms.

This area provides a good combination of food, cover, and nesting places for quail and rabbit. A few fox squirrels live in small woodlots. Mourning doves are common in areas where grain is grown. Raccoons and woodchucks are common, and there are a few white-tailed deer. This area provides the best habitat for waterfowl in the two counties. Migrating waterfowl are fairly common, especially along the Ohio River.

WILDLIFE HABITAT AREA 2

This wildlife area is conterminous with the Monongahela-Upshur-Muskingum-Zoar soil association. The soils in this area are on old high terraces that are mainly above the Ohio River and that are strongly dissected by small streams. The soils are mostly gently sloping to strongly sloping, but they are very steep in a few areas. The highly erodible Upshur and Muskingum soils are in the steeper areas. The Monongahela and Zoar soils are generally low in fertility.

Most of this wildlife area is woodland consisting of pines and hardwoods. The open land is mostly along main roads. Some areas are in housing and industrial development. The open farmland, which is used mainly for hay and pasture, supports fair numbers of quail and cottontail rabbit. Abandoned farmland that is overgrown with brush supports ruffed grouse and an increasing number of deer. Gray and fox squirrels are scattered throughout this wildlife area, but are most abundant in areas of hardwoods.

WILDLIFE HABITAT AREA 3

This wildlife area consists of the Moshannon-Monongahela-Hackers, the Upshur-Muskingum-Brooke, and the Upshur-Muskingum-Vandelia soil associations. The area is a hilly one and has narrow valleys. The soils are mainly strongly sloping to steep, but they range from nearly level to very steep. The most extensive soils are in the Upshur-Brooke and the Upshur-Muskingum complexes. The reddish Moshannon soils are common on bottom lands, and the Monongahela soils are on smooth terraces.

About two-thirds of this wildlife area is woodland in which hardwoods are dominant. Many formerly cultivated fields have grown up in Virginia pine or brushy hardwoods. The woodlots are generally small, but trees grow in some fairly extensive areas, especially in the northern part of this wildlife area. In the hilly areas the open land is used mainly for hay and pasture. Corn and hay are grown on bottom lands.

Cottontail rabbits are common in this wildlife area. They find food and nesting places in the hayfields and improved pastures. Unimproved pastures generally provide nesting places and escape cover, but food suitable for rabbits is scarce in some places. Gray and fox squirrels are common through this wildlife area because oak and hickory trees furnish adequate food. Generally, there are enough den trees to accommodate large numbers of squirrels. Bobwhite quail are plentiful throughout this wildlife area. Ruffed grouse are common in fields that have grown up in brush and in the stands of hardwoods nearby. White-tailed deer are most common in the northern parts of this wildlife area. They commonly graze in the hayfields near the wooded areas, and they also browse on the brushy hardwoods that grow in some areas that were once used for hay or pasture (fig. 8). Raccoon, woodchuck, and gray fox and red fox are common throughout most of the area.

WILDLIFE HABITAT AREA 4

This wildlife area consists of the Muskingum and the Muskingum-Upshur-Vandalia soil associations. The area is in the eastern part of Wood County and in the eastern and southeastern parts of Wirt County. It consists mainly of moderately steep to very steep soils on rough hills and in narrow valleys. The closely intermingled Upshur and Muskingum soils are dominant.

Figure 8.—A part of wildlife habitat area 3 (Upshur-Muskingum-Vandalia soil association) that was used for pasture but is now a habitat for white-tailed deer and other wildlife.

About three-fourths of this wildlife area is woodland; several of the wooded areas are large. The trees are mostly hardwoods, but there are some scattered stands of Virginia pine. Most of the open land is in pasture or hay, but on the narrow bottom lands corn is grown in a rotation with hay. Many of the steeper areas are growing up in brush.

Cottontail rabbits are common in the open areas. The hayfields and the areas used for improved pasture generally furnish adequate food, nesting places, and travel lanes for these rabbits. Squirrels are fairly common throughout most of this wildlife area. The oak, hickory, and beech trees generally supply adequate food, and there are enough den trees to accomodate a large number of squirrels. A few bobwhite quail live in or near the open areas, but these areas are dominantly grassland and are poor habitats for quail. Numerous ruffed grouse live in the areas that have grown up in brush and are adjacent to stands of hardwood trees. This habitat generally furnishes adequate food, nesting places, and travel lanes for the grouse. Deer, raccoon, woodchuck, gray fox, and red fox are common throughout this wildlife area. Habitat for deer have been improved by allowing brush to grow in some areas that were formerly used for hay or pasture.

Suitability of soils for wildlife

In table 3 the soils and land types of Wood and Wirt Counties are rated according to their relative suitability for elements of wildlife habitat and for kinds of wildlife. These ratings were made on the basis of the soil features that limit or control the amount of food, water, and cover available for wildlife and the kinds and numbers of wildlife in any area (*1*). The ratings are 1, 2, 3, and 4, each number indicating the relative suitability of a soil for a given element of wildlife habitat and also the relative extent of a particular limitation.

TABLE 3.—*Suitability of soils for elements of wildlife habitat and for kinds of wildlife*

Soils and map symbols	Elements of wildlife habitat								Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
Allen:											
AeB, AeC	2	1	1	1	3	4	4	4	1	1	4
AeC3	3	2	1	1	3	4	4	4	2	1	4
AeD3	4	3	1	1	3	4	4	4	3	2	4
Ashton:											
AsA	1	1	1	1	3	4	4	3–4	1	1	4
AsB	2	1	1	1	3	4	4	4	1	1	4
Cotaco:											
CoA	1–2	1–2	1	1	3	3	2–3	2–3	1	1	3
CoB, CoC	2	1–2	1	1	3	4	4	3	1	1	4
Duncannon:											
DuB, DuC	2	1	1	1	3	4	4	3–4	1	1	4
DuD	3	2	1	1	3	4	4	4	2	1	4
DuE	4	3	1	1	3	4	4	4	3	1	4
Ginat:											
Gn	3	3	2	2	3	3	4	4	3	2	4
Hackers:											
HaA, HcA	1	1	1	1	3	4	4	3–4	1	1	4
HaB, HaC, HcB, HcC	2	1	1	1	3	4	4	4	1	1	4
HcD	3	2	1	1	3	4	4	4	2	2	4
Huntington:											
HnA	1	1	1	1	3	4	4	4	1	1	4
Hf, HnB	2	1	1	1	3	4	4	4	1	1	4
Ht	2	3	2	2	3	4	4	4	2	2	4
Lakin:											
LkD	4	3	3	3	1	4	4	4	3–4	3	4
LaB, LkB, LkC	3	3	3	3	1	4	4	4	3	3	4
Lindside:											
Ln	2	1	1	1	3	3	3	3	1	1	3
Markland:											
MdB, MdC	2	1–2	1	1	3	4	4	3–4	2	2	4
MeC3	3	2	1	1	3	4	4	4	2	2	4
MdE, MeD3	4	3	1	1	3	4	4	4	3	2	4
MeE3	4	3–4	2	2	3	4	4	4	3	2	4
McGary:											
Mg	3	3	2	2	2	2	1	1	3	2	2
Melvin:											
Ml	3	2	2	1	2	2–3	3	3	2	1	2–3
Monongahela and Tilsit:											
MnA	2	2	1	1	3	3	3	3	2	1	3
MnB, MnC	2	2	1	1	3	4	4	3–4	2	1	4
MnC3, MnD	3	2	1	1	3	4	4	4	2	2	4
MnD3	4	3	1	1	3	4	4	4	3	2	4
Moshannon:											
MoA, MoB, Mt	1–2	1	1	1	3	4	4	4	1	1	4
Ms	3–4	2–3	1	1	2	4	4	4	4	1	4
Muskingum:											
MuC	2	2	1	1	3	4	4	4	1	2	4
MuC3, MuD	3	2	1	1	3	4	4	4	2	2	4
MuD3, MuE	4	3	1	1	3	4	4	4	3	2	4
MuF, MuF3	4	4	2	2	2	4	4	4	4	2	4

See footnote at end of table.

TABLE 3.—*Suitability of soils for elements of wildlife habitat and for kinds of wildlife*—Continued

Soils and map symbols	Elements of wildlife habitat								Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
Sciotoville:											
ScA, ScB	2	1	1	1	3	4	4	4	1	1	4
Senecaville:											
Se	2	1	1	1	3	3	3	3	1	1	3
Sn	3–4	2–3	1	1	2	3	3	4	3–4	1	3–4
Steep land, alluvial materials:											
StF	4	3–4	1	1	2–3	4	4	4	2–3	2	4
Tygart:											
Ty	3	3	2	2	2	2	1	1	3	2	1
Upshur:											
UcB	2	1	1	2	3	4	4	3–4	1	1	4
UcC, UdC3	3	2	1	2	3	4	4	4	2	1	4
UcD, UdD3	4	3	2	2	2	4	4	4	3	2	4
Upshur-Brooke:											
UeC, UhC3	3	2	1	2	3	4	4	4	2	1	4
UeD, UhD3	4	3	2	2	2	4	4	4	3	2	4
UhD4	4	4	2–3	2	1–2	4	4	4	3–4	3	4
Upshur-Muskingum: [1]											
UmB, UmC	2 (2)	1 (2)	1 (1)	2 (1)	3 (3)	4 (4)	4 (4)	4 (4)	1 (1)	1 (2)	4 (4)
UmC3, UmD	3 (3)	2 (2)	1 (1)	2 (1)	3 (3)	4 (4)	4 (4)	4 (4)	2 (2)	1 (2)	4 (4)
UmD3, UmE	4 (4)	3 (3)	2 (1)	2 (1)	2 (3)	4 (4)	4 (4)	4 (4)	3 (3)	2 (2)	4 (4)
UmD4, UmE3, UmF, UmF3, UmF4	4 (4)	4 (4)	2–3 (2)	2 (2)	1–2 (2)	4 (4)	4 (4)	4 (4)	3–4 (4)	3 (2)	4 (4)
UvF	4 (4)	4 (4)	1 (1)	1 (1)	3 (3)	4 (4)	4 (4)	4 (4)	3 (3)	2 (2)	4 (4)
Vandalia:											
VaB, VaC	2	1	1	1	3	4	4	3–4	1	1	4
VaC3, VaD	3	2	1	1	3	4	4	4	2	1	4
VaD3, VaE	4	2	1	1	3	4	4	4	3	2	4
VaE3, VsD4	4	4	2	1–2	2–3	4	4	4	3	3	4
VdD, VdE	4	3–4	2	1	3	4	4	4	3	2	4
Wheeling:											
WeA, WeB, WeC, WhB, WhC	2	1	1	1	3	4	4	4	1	1	4
WhA	1	1	1	1	3	4	4	4	1	1	4
Zoar:											
ZoB, ZoC	2	2	1	1	3	4	4	3–4	2	1	4
ZsC3	3	2	1	1	3	4	4	4	2	1	4
ZsD3	4	3	2	2	2	4	4	4	3	1	4

[1] First number in columns is rating for Upshur soil in the Upshur-Muskingum complexes; number in parentheses is rating for Muskingum soil.

In table 3 numbers indicate ratings as follows: 1, well suited; 2, suited; 3, poorly suited; and 4, unsuited. A rating of *well suited* means that the soil has few or no limitations to use as the element of wildlife habitat. A rating of *suited* indicates that the habitat element can be created, improved, or maintained, but there are moderate limitations that affect management and that moderately intensive measures are needed to overcome or correct the limitations. *Poorly suited* means that the habitat element can be created, improved, or maintained, but that limitations are severe and that difficult and expensive measures are needed. A rating of *unsuited* indicates that the habitat cannot be created, improved, or maintained, or that it is impractical to do so under the prevailing conditions.

The following lists important plants or describes each of the elements of wildlife habitat rated in table 3.

Grain and seed crops consist of domestic grains or seed-producing annuals that are planted to produce food for wildlife. Examples are corn, sorghums, wheat, millet, buckwheat, and soybeans.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted to furnish food and cover for wildlife. Examples are fescue, bluegrass, timothy, orchardgrass, reed canarygrass, clover, alfalfa, and sericea lespedeza.

Wild herbaceous upland plants are native or introduced perennial grasses and forbs (weeds) that generally are established naturally and that provide food and cover mainly for upland wildlife. Examples are indiangrass, wild ryegrass, oatgrass, pokeweed, strawberries, lespedeza, beggarweed, ragweed, goldenrod, and dandelion.

Hardwood woody plants are nonconiferous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, twigs (browse), or foliage. These plants are used extensively as food by wildlife and are commonly established naturally but also may be planted. Examples are oak, beech, hickory, cherry, walnut, dogwood, and poplar. Smaller plants include grape, honeysuckle, and briers.

Coniferous woody plants are cone-bearing trees and shrubs that are important to wildlife mainly as cover but that also furnish food in the form of browse, seeds, or fruitlike cones. These trees and shrubs are commonly established naturally, but they also may be planted. Examples are Virginia pine, white pine, red cedar, and hemlock. In table 3, the soils are rated on the basis of slow growth and delayed canopy closure.

Wetland food and cover plants are annual and perennial, wild herbaceous plants on moist to wet sites. These plants do not include submerged or floating aquatic plants that produce the food and cover used mainly by wetland wildlife. Examples of wetland food and cover plants are smartweed, wild millet, rushes, sedges, wild rice, switchgrass, and cattails.

Shallow water developments are areas that have been made by impounding water, by digging excavations, or by using devices to control water. In table 3 the soils are rated on the basis of the suitability for water developments that generally are no more than 6 feet deep. Examples of such developments are low dikes and levees; shallow dugouts; level ditches; and devices that control the water level in marshy drainageways or channels.

Excavated ponds are dug-out areas or combinations of dug-out areas and low dikes (dammed areas) that hold enough water of suitable quality and depth to support fish or wildlife. Such ponds should be built in nearly level areas, and they should have a surface area of at least one-fourth acre and an average depth of 6 feet in at least one-fourth of the area. Also required is a water table that is permanently high or another source of unpolluted water.

In table 3 the soils are also rated according to their suitability for three kinds of wildlife in the two counties. The ratings are based on the ratings given to the elements of wildlife habitat shown in the first part of the table. The following lists the important animals and birds in each of the 3 categories of wildlife listed in table 3.

Openland wildlife consists of birds and mammals that commonly frequent cropland, meadow, pasture, and areas that are overgrown with grasses, weeds, and shrubs. Among these birds and mammals are bobwhite quail, ringnecked pheasants, mourning dove, woodcocks, cottontail rabbits, meadow larks, killdeer, and field sparrow.

Woodland wildlife consists of birds and mammals that commonly frequent wooded areas. Ruffed grouse, wild turkeys, deer, squirrels, raccoons, wood thrushes, warblers, and vireos are examples of woodland wildlife.

Wetland wildlife consists of birds and mammals commonly found in ponds, marshes, swamps, and other wet areas. Among this kind of wildlife are ducks, geese, herons, snipe, rails, coots, muskrat, mink, and beaver.

Engineering Uses of Soils [3]

In this section two systems of soil classification used by engineers are explained, soil properties important in engineering are estimated for the soils in the county, and the soils are interpreted according to their use in engineering. Also given are engineering test data for selected soils.

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, foundations for buildings, facilities for water storage, structures for erosion control, drainage systems, and sewage disposal systems. The soil properties most important to the engineer are permeability, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and reaction (pH). Depth to the water table, depth to bedrock, and topography also are important. The information in this survey can be used to—

1. Make soil and land use studies that will aid in selecting and developing sites for industry, business, residences, and recreation.
2. Make preliminary estimates of the engineering properties of soils that help in the planning of agricultural drainage systems, farm ponds, irrigation systems, diversion terraces, and waterways.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways, airports, pipelines, and cables and in planning detailed investigations at the selected locations.
4. Locate probable sources of gravel and other construction material.
5. Correlate performance of engineering structures with soil mapping units, and thus develop information that will be useful in designing and maintaining the structures.
6. Determine the suitability of soil mapping units for cross-country movement of vehicles and construction equipment.
7. Supplement the information obtained from other published maps and reports and from aerial photographs so as to make maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

With the use of the soil map for identification, the engineering interpretations in this section can be useful for many purposes. It should be emphasized, however, that the interpretations do not eliminate the need for sampling and testing at the site of specific engineering

[3] WILLIAM T. JAMES, Jr., engineering specialist, Soil Conservation Service, assisted in preparing this section.

works where loads are heavy and where the excavations are deeper than here reported. Even in these situations, however, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some of the terms used by soil scientists may not be familiar to the engineer, and some terms may have special meaning in soil science. Several of these terms are defined in the Glossary at the back of this survey.

Much of the information in this section is given in tables 4, 5, and 6, but additional information useful to engineers can be found in other sections of this soil survey, particularly the section "Descriptions of the Soils."

Engineering classification systems

Two systems of classifying soils are in general use among engineers. Both are used in this soil survey.

The Unified classification system was established by the Waterways Experiment Station, Corps of Engineers (15). In this system soil material is identified as coarse grained, fine grained, and highly organic. The coarse-grained soils are subdivided into sand (S) and gravel (G). The soils in each of these groups are classified on the basis of the amount of fines they contain. Fine-grained soils are subdivided into silts (M) and clays (C), depending on their liquid limit and plasticity index. Each of these groups

TABLE 4.—*Estimated engineering*

[Absence of data indicates estimate was not made. Estimates were not made for

Series and map symbols	Depth to seasonal high water table	Depth to bedrock	Depth from surface	Classification
				USDA texture
	Feet	*Feet*	*Inches*	
Allen (AeB, AeC, AeC3, AeD3)	4+	6+	0–17	Loam
			17–48	Clay loam
			48–60	Sandy clay loam
Ashton (AsA, AsB)	5+	8+	0–18	Silt loam
			18–42	Silt loam
			42–60	Sandy clay loam, fine sandy loam
Brooke	4+	2½–4	0–12	Silty clay
			12–30	Clay to silty clay
			30	Bedrock.
Cotaco (CoA, CoB, CoC)	1½–2	6+	0–9	Silt loam
			9–42	Silty clay loam to clay loam
			42–60	Loam
Duncannon (DuB, DuC, DuD, DuE)	5+	5+	0–44	Silt loam
Ginat (Gn)	0	10+	0–11	Silt loam or loam
			11–52	Clay loam or sandy clay loam
			52–60	Loamy fine sand
Hackers (HaA, HaB, HaC, HcA, HcB, HcC, HcD).	5+	8+	0–14	Silt loam
			14–35	Silty clay loam
			35–48	Sandy clay loam
Huntington (Hf, HnA, HnB, Ht)	4+	6+	0–74	Silt loam, sandy clay loam, clay loam
			74–80	Fine sandy loam
Lakin (LaB, LkB, LkC, LkD)	5+	6+	0–11	Loamy fine sand
			11–144	Loamy fine sand to sand
Lindside (Ln)	1–2	6+	0–17	Silt loam
			17–42	Silty clay loam to silt loam
Markland (MdB, MdC, MdE, MeC3, MeD3, MeE3).	1–2	6+	0–19	Silt loam to silty clay loam
			19–25	Silty clay
			25–60	Clay
McGary (Mg)	0–1	6+	0–12	Silty clay loam
			12–72	Silty clay to clay
Melvin (Ml)	0	6+	0–18	Silt loam
			18–36	Silt loam to silty clay loam
Monongahela (MnA, MnB, MnC, MnC3, MnD, MnD3). (For properties of Tilsit soils in these mapping units, refer to the Tilsit series.)	1½–2	6+	0–7	Silt loam
			7–19	Heavy silt loam
			19–40	Clay loam (fragipan)

is further classified on the basis of whether the soils have a low (L) or high (H) liquid limit. Silts and clays that have a low liquid limit are identified by the symbols ML and CL, and silt and clays that have a high liquid limit are identified by the symbols MH and CH. Soils on the borderline between two classifications are given a joint classification, for example, SM–ML. Table 4 shows the estimated Unified classification of most of the soils in Wood and Wirt Counties.

Many highway engineers classify soil material according to the system approved by the American Association of State Highway Officials (AASHO) (2). In this system, the soils having about the same general load-carrying capacity are grouped together in seven major groups. The groups range from A–1, consisting of gravelly soils of high bearing capacity, to A–7, consisting of clay soils having low strength when wet. Within each group, the relative engineering value of the soil material is indicated by a group index number. Group index numbers range from 0 for the best material to 20 for the poorest. The group index number for the soils tested is given in table 6. It is shown in parentheses following the soil subgroup symbol, for example, A–7–5(11). The estimated AASHO classification of the soils in the two counties, without the group index number, is given in table 4.

properties of soils

Made land (Ma) and Steep land, alluvial materials (StF)]

Classification—Continued		Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.76 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
					Inches per hour	*Inches per inch of soil*	*pH*	
ML	A–4	90–100	85–100	60–75	2. 0–6. 3	0. 18	----------	Low.
CL	A–6, A–4	85–100	80–100	65–80	0. 63–2. 0	0. 15–0. 18	4. 5–5. 0	Moderate to low.
SC, CL	A–4	80–100	75–100	40–70	0. 63–2. 0	0. 12–0. 15	4. 5–5. 0	Low.
ML	A–4	95–100	90–100	65–90	0. 63–2. 0	0. 18+	----------	Low.
CL, ML	A–6, A–4	95–100	90–100	75–95	0. 63–2. 0	0. 18–0. 23	5. 5–6. 5	Low to moderate.
SC, SM	A–4, A–2	90–100	65–80	20–40	6. 3+	0. 08–0. 12	5. 5–6. 5	Low.
CL, MH	A–6, A–7	95–100	90–100	80–95	0. 63–2. 0	0. 12–0. 15	----------	Moderate to high.
CH, MH	A–7	80–90	75–85	55–80	0. 2–0. 63	0. 15–0. 18	6. 0–7. 0+	High.
ML, CL	A–4, A–6	90–100	90–100	75–90	0. 63–2. 0	0. 18	----------	Low.
CL, ML	A–6, A–4	90–100	90–100	75–90	0. 20–0. 63	0. 16–0. 18	4. 5–5. 5	Moderate.
ML, CL	A–4, A–6	85–95	80–95	65–80	0. 63–2. 0	0. 15–0. 18	4. 5–5. 5	Moderate.
ML, ML–CL	A–4	95–100	95–100	70–100	0. 63–2. 0	0. 15–0. 18	4. 5–5. 5	Low to moderate.
ML	A–4	90–100	85–100	70–90	0. 63–2. 0	0. 15–0. 18	----------	Low.
CL	A–6	90–100	80–95	60–90	0. 20–0. 63	0. 14–0. 20	4. 5–5. 5	Low to moderate.
SM–ML	A–2, A–4	90–100	70–95	30–55	6. 3+	0. 08	4. 5–5. 5	Low.
ML	A–4	95–100	95–100	75–95	0. 63–2. 0	0. 18+	----------	Low.
CL	A–6	95–100	95–100	80–100	0. 63–2. 0	0. 18–0. 23	5. 5–6. 0	Moderate.
SC, SM	A–4, A–2	90–100	70–90	20–40	2. 0–6. 3	0. 08–0. 12	5. 5–6. 0	Low.
ML, CL, SM	A–4, A–6, A–2	95–100	80–100	30–90	0. 63–2. 0	0. 15–0. 18+	5. 5–7. 0	Low.
SM, SC	A–2	90–100	65–80	15–30	2. 0–6. 3	0. 12–0. 15	5. 5–7. 0	Low.
SM	A–2	100	95–100	10–35	6. 3+	0. 08–0. 12	----------	Low.
SM, SP–SM	A–2, A–1	100	95–100	5–30	6. 3+	<0. 08	4. 5–5. 5	Low.
ML	A–4	95–100	95–100	70–80	0. 63–2. 0	0. 18+	----------	Low.
ML, CL	A–4, A–6	95–100	90–100	65–90	0. 20–0. 63	0. 19–0. 21	5. 5–7. 0	Moderate to low.
ML, MH	A–4, A–7	95–100	95–100	60–95	0. 20–2. 0	0. 15–0. 18	----------	Moderate.
CH, MH	A–7	95–100	95–100	90–100	0. 20–0. 63	0. 15–0. 18	5. 5–6. 5	High.
CH, MH	A–7, A–6	95–100	95–100	90–100	<0. 2	0. 15–0. 18	6. 0–7. 0+	High.
MH, ML	A–7, A–6	85–100	70–100	50–75	0. 63–2. 0	0. 15–0. 18+	----------	Low to high.
MH–CH, CL, ML–CL	A–7, A–6	95–100	95–100	85–100	0. 06–0. 2	0. 15–0. 18	5. 5–7. 0+	Moderate to high.
ML, CL	A–4	95–100	95–100	75–90	0. 63–2. 0	0. 18+	5. 5–6. 5+	Low.
ML, CL	A–4, A–6	95–100	95–100	80–95	0. 20–0. 63	0. 15–0. 18	6. 0–6. 5+	Moderate to low.
ML	A–4	95–100	90–100	75–90	0. 63–2. 0	0. 18	----------	Low.
ML, CL, MH	A–4, A–6	95–100	90–100	75–90	0. 63–2. 0	0. 15–0. 18	4. 5–5. 5	Moderate.
ML, CL, MH	A–6, A–7	90–100	80–95	50–80	0. 20–0. 63	0. 15–0. 18	4. 5–5. 5	Moderate.

TABLE 4.—*Estimated engineering*

Series and map symbols	Depth to seasonal high water table	Depth to bedrock	Depth from surface	Classification
				USDA texture
	Feet	*Feet*	*Inches*	
Moshannon (MoA, MoB, Ms, Mt)	2+	4+	0–15	Silt loam
			15–32	Silty clay loam
			32–40	Sandy clay loam to silty clay loam
			40–60	Fine sandy loam.
Muskingum (MuC, MuC3, MuD, MuD3, MuE, MuF3, MuF).	3+	2–3	0–8	Silt loam
			8–18	Silt loam
			18–33	Stony silt loam
			33	Bedrock.
Sciotoville (ScA, ScB)	1½–2	10+	0–15	Silt loam, loam
			15–32	Silt loam
			32–46	Fine sandy loam
Senecaville (Se, Sn)	1–2	4+	0–12	Silt loam
			12–36	Silty clay loam
			36–42	Stratified silt and fine sand
Tilsit	1½	3+	0–9	Silt loam
			9–24	Silt loam to silty clay loam
			24–34	Silt loam to silty clay loam (fragipan)
Tygart (Ty)	0–1	6+	0–10	Silt loam
			10–17	Silty clay loam
			17–34	Silty clay
Upshur (UcB, UcC, UcD, UdC3, UdD3, UeC, UeD, UhC3, UhD3, UhD4, UmB, UmC, UmC3, UmD, UmD3, UmD4, UmE, UmE3, UmF4, UmF, UmF3, UvF). (For properties of the Brooke soils in mapping units UeC, UeD, UhC3, UhD3, UhD4, refer to the Brooke series. For properties of Muskingum soils in mapping units UmB, UmC, UmC3, UmD, UmD3, UmD4, UmE, UmE3, UmF4, UmF, UmF3, UvF, refer to the Muskingum series.)	4+	2½–6	0–6	Silty clay
			6–42	Clay
			42–54	Clay
			54	Bedrock.
Vandalia (VaB, VaC, VaC3, VaD, VaD3, VaE, VaE3, VdD, VdE, VsD4).	4+	5+	0–17	Silty clay loam
			17–43	Silty clay
			43–72	Clay
Wheeling (WeA, WeB, WeC, WhA, WhB, WhC)	4+	10+	0–34	Silt loam to silty clay loam
			34–64	Very fine sandy loam or very gravelly sandy loam.
			64–80	Stratified sand and gravel
Zoar (ZoB, ZoC, ZsC3, ZsD3)	1½–2	5–10+	0–15	Silt loam
			15–30	Silty clay loam and silty clay
			30–39	Clay

Engineering properties of soils

Estimated in table 4, generally by layers, are soil properties that are important to engineering, engineering and textural classifications of soil material, and percentages of soil material passing sieves of three sizes. The data in table 4 are based on the results of soil tests shown in table 6 and on data obtained from similar soils in Jackson and Mason Counties and in Marshall County. Not included in table 4 are the land types, Made land (Ma) and Steep land, alluvial materials (StF).

Depth to a seasonal high water table and to bedrock are indicated in table 4. Soils that have a high water table are limited in their use for highways and other construction. Depth to bedrock is important to the engineer because it may greatly affect designing, constructing, and maintaining structures.

The column headed "Depth from surface" indicates the depth and thickness of the layers for which estimates were made. The layers reported in table 4 are fewer and generally thicker than those in the detailed profiles described in the section "Descriptions of the Soils."

Listed for the layers in table 4 are the USDA textural classification, the AASHO and Unified engineering clas-

properties of soils—Continued

Classification—Continued		Percentage passing sieve—			Permeability	Available moisture capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.76 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
					Inches per hour	*Inches per inch of soil*	*pH*	
ML	A-4	90-100	85-100	75-90	0. 63-2. 0	0. 18+	----------	Low.
CL	A-6	90-100	85-100	80-95	0. 63-2. 0	0. 18-0. 23	5. 5-6. 0	Moderate.
SC, SM	A-2, A-6	85-100	70-85	20-40	2. 0 -6. 3+	0. 12-0. 15	5. 5-6. 0	Low.
ML, SM-SC	A-4, A-2	65-90	60-80	25-70	0. 63-2. 0	0. 12-0. 15	----------	Low.
ML-CL, SM-SC	A-4, A-2	70-90	50-85	25-70	2. 0 -6. 3	0. 08-0. 12	4. 5-5. 5	Low.
GM-GC, SM-SC	A-4, A-2	40-80	30-70	25-50	6. 3+	0. 08	4. 5-5. 5	Low.
ML	A-4	90-100	90-100	75-90	2. 0-6. 3	0. 15-0. 18	----------	Low.
CL-ML	A-6, A-4	90-100	85-100	80-90	0. 20-0. 63	0. 12-0. 15	5. 0-6. 0	Moderate.
SM	A-2, A-4	90-100	85-100	25-40	6. 3+	<0. 08	5. 0-5. 5	Low.
ML	A-4	95-100	95-100	75-90	0. 63-2. 0	0. 18+	----------	Low.
CL, ML	A-6	95-100	90-100	80-95	0. 20-0. 63	0. 15-0. 18+	5. 5-6. 0	Moderate to low.
ML, CL, SM	A-4	90-100	80-95	45-80	6. 3+	0. 08	5. 5-6. 0	Low.
ML, CL	A-4	95-100	90-100	75-90	0. 63-2. 0	0. 18	----------	Low.
ML, CL, MH	A-6, A-7	95-100	90-100	75-90	0. 63-2. 0	0. 15-0. 18	4. 5-5. 5	Moderate.
ML, CL	A-4, A-6	90-100	80-95	55-90	0. 20-0. 63	0. 12-0. 15	4. 5-5. 5	Moderate.
ML, CL	A-4, A-6	95-100	85-100	65-85	0. 63-2. 0	0. 18+	----------	Low to moderate.
ML, CL	A-6, A-7	95-100	85-100	80-95	0. 20-0. 63	0. 15-0. 18	4. 5-5. 5	Moderate.
CL, CH	A-7	95-100	90-100	85-95	<0. 20	0. 12-0. 15	4. 5-5. 5	High.
MH, ML	A-6, A-7	95-100	90-100	80-95	0. 20-0. 63	0. 18+	----------	Moderate.
MH, CH	A-7	95-100	90-100	85-100	<0. 20	0. 12-0. 15	5. 0-7. 0	High.
MH-CH, ML-CL	A-7	80-95	80-95	50-95	<0. 20	0. 12-0. 15	5. 0-7. 0	High.
MH, GM	A-6, A-7	60-90	60-85	35-70	0. 63-2. 0	0. 15-0. 18+	----------	Moderate.
ML-CL, MH-CH	A-7	70-95	70-95	60-85	0. 20-0. 63	0. 12-0. 15	5. 0-6. 0	High.
CL, MH-CH	A-7	70-100	65-100	50-95	<0. 2	0. 08-0. 12	5. 5-6. 5	High.
ML, CL	A-4, A-6	90-100	90-100	50-95	0. 63-2. 0	0. 08-0. 12	5. 5-6. 5	Moderate.
ML, CL, SM	A-4, A-6	85-100	85-100	40-90	2. 0-6. 3	0. 08-0. 12	5. 0-5. 5	Low.
GW-GM, GC, GM	A-2	40-80	30-70	5-35	6. 3+	0. 08	----------	Low.
ML, CL	A-4, A-6	95-100	95-100	80-95	0. 63-2. 0	0. 15-0. 18	----------	Low.
CL, CH	A-6, A-7	95-100	95-100	85-100	0. 2-0. 63	0. 12-0. 15	5. 0-5. 5	Moderate to high.
CH, MH	A-7	95-100	95-100	90-100	<0. 20	0. 08-0. 12	5. 0-5. 5	Moderate to high.

sifications, and the estimated percentages of material that pass Nos. 4, 10, and 200 sieves. The amount of material passing a No. 200 sieve determines whether soil material is coarse grained or fine grained.

Permeability refers to the rate that water moves through the soil. It depends mainly on texture and structure, but it also may be affected by other physical properties. In table 4, permeability is estimated in inches of water percolation per hour.

The available moisture capacity, estimated in inches per inch of soil depth, is the approximate amount of water a soil can hold available for plants. It is the water held in the range between field capacity and the wilting point of plants.

Reaction is given in pH values, which indicate the degree of acidity or alkalinity of the soil material. In table 4, the values are based on several field checks, but in some places the values may be above or below those shown. Higher values indicate alkaline material and lower values acid material, as shown in the Glossary. The pH values are not given for the uppermost layer, because most of the soils in these two counties have been limed.

TABLE 5.—*Engineering*

[Interpretations were not made for Made land

Soils and map symbols	Suitability as a source of— Topsoil	Suitability as a source of— Road fill	Suitability for winter grading	Susceptibility to frost action	Susceptibility to slippage	Soil features affecting— Location of highways
Allen (AeB, AeC, AeC3, AeD3)	Good	Fair	Fair	Moderate	Low	No undesirable features.
Ashton (AsA, AsB)	Good	Fair	Fair	Moderate	Low	Flooding
Brooke	Fair to poor.	Poor	Poor	Moderate to high.	High	Instability; plastic clay; susceptible to slipping.
Cotaco (CoA, CoB, CoC)	Good to fair.	Fair	Poor	Moderate	Low	Seasonal high water table.
Duncannon (DuB, DuC, DuD, DuE).	Good to fair.	Fair	Fair	Moderate to high.	Low	Fair to low stability.
Ginat (Gn)	Fair to good.	Fair	Unsuitable	High	Low	High water table
Hackers (HaA, HaB, HaC, HcA, HcB, HcC, HcD).	Good	Fair	Fair	Moderate	Low	Flooding
Huntington (Hf, HnA, HnB, Ht)	Good	Fair	Fair	Moderate	Low	Flooding
Lakin (LaB, LkB, LkC, LkD)	Poor	Fair	Good	Low	Low	Unstable deposits of sand.
Lindside (Ln)	Good	Fair	Poor	Moderate	Low	Flooding; seasonal high water table.
Markland (MdB, MdC, MdE, MeC3, MeD3, MeE3).	Fair	Poor	Unsuitable	High	Moderate where slopes are more than 20 percent.	Seasonal high water table; instability; susceptible to slipping where slopes are steep.
McGary (Mg)	Fair	Poor	Unsuitable	High	Low	Seasonal high water table; instability.

interpretations of soils

(Ma) and Steep land, alluvial materials (StF)]

Soil features affecting—Continued						Construction and maintenance of pipelines
Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways	
Reservoir area	Embankments					
Pervious substratum.	Stable material; pervious in foundations.	Not needed	No undesirable features.	No undesirable features.	Erodibility on steep slopes.	No special problems.
Flooding; pervious substratum.	Flooding; pervious substratum.	Not needed	No undesirable features.	Not needed in most places.	Not needed in most places.	Flooding.
Small seepage losses; susceptible to slipping.	Instability; plastic.	Not needed	Moderately slow permeability; rapid runoff.	Erodibility	Erodibility	Plastic clay; susceptible to slipping; limestone bedrock.
Sandy substratum in some places.	Fair stability	Moderately slow permeability; seasonal high water table.	Seasonal high water table.	Not needed in most places.	Not needed in most places.	Seasonal high water table.
Pervious substratum.	Fair to poor stability; pervious substratum.	Not needed	No undesirable features.	High erodibility; fair to poor stability.	High erodibility	No special problems.
Pervious substratum; high water table.	Fair stability; subject to piping in some places.	High water table; lack of outlets.	High water table.	High water table.	High water table.	High water table.
Flooding; pervious substratum.	Flooding; fair stability.	Not needed	No undesirable features.	Not needed in most places.	Not needed in most places.	Flooding.
Flooding; pervious substratum.	Flooding; fair stability.	Not needed	No undesirable features.	Not needed in most places.	Not needed in most places.	Flooding.
Very rapid permeability.	Poor stability; very rapid permeability.	Not needed	Low water-holding capacity.	Very rapid permeability; erodibility in channels.	Droughty; erodibility in channels.	No special problems.
Flooding; pervious substratum.	Flooding; fair stability.	Seasonal high water table; flooding.	Seasonal high water table; flood hazard.	Seasonal high water table; flooding.	Seasonal high water table; flooding.	Flooding; seasonal high water table.
Small seepage losses; seasonal high water table.	Instability; erodibility.	Slow permeability; subsurface drainage difficult; seasonal high water table.	Slow permeability; seasonal high water table.	Seasonal high water table; erodibility.	Seasonal high water table; erodibility.	Seasonal high water table.
Small seepage losses; seasonal high water table.	Instability; erodibility.	Slow permeability; seasonal high water table; subsurface drainage difficult.	Slow permeability; seasonal high water table.	Seasonal high water table; erodibility.	Seasonal high water table; erodibility.	Seasonal high water table.

336-400—70——3

TABLE 5.—*Engineering*

Soils and map symbols	Suitability as a source of—		Suitability for winter grading	Susceptibility to frost action	Susceptibility to slippage	Soil features affecting—
	Topsoil	Road fill				Location of highways
Melvin (Ml)	Good	Poor	Unsuitable	High	Low	Flooding; high water table.
Monongahela (MnA, MnB, MnC, MnC3, MnD, MnD3). (For interpretations for Tilsit soils in these mapping units, refer to the Tilsit series.)	Fair to good.	Fair	Poor	Moderate	Low	Seasonal high water table; seepage on top of fragipan.
Moshannon (MoA, MoB, Ms, Mt).	Good	Fair	Fair	Moderate	Low	Flooding; seasonal high water table in some areas.
Muskingum (MuC, MuC3, MuD, MuD3, MuE, MuF3, MuF).	Fair to poor.	Fair to good.	Fair	Moderate	Low	Shallowness to shale and sandstone bedrock.
Sciotoville (ScA, ScB)	Fair to good.	Good to fair.	Fair	Moderate	Low	Seasonal high water table.
Senecaville (Se, Sn)	Good	Fair	Poor	Moderate	Low	Flooding; high water table.
Tilsit	Fair to good.	Fair	Poor	Moderate	Low	Seasonal high water table; seepage on top of fragipan.
Tygart (Ty)	Fair	Poor	Unsuitable	High	Low	Seasonal high water table; instability.
Upshur (UcB, UcC, UcD, UdC3, UdD3, UeC, UeD, UhC3, UhD3, UhD4, UmB, UmC, UmC3, UmD, UmD3, UmD4, UmE, UmE3, UmF4, UmF, UmF3, UvF). (For interpretations for Brooke soils in mapping units UeC, UeD, UhC3, UhD3, and UhD4, refer to the Brooke series. For interpretations for the Muskingum soils in mapping units UmB, UmC, UmC3, UmD, UmD3, UmD4, UmE, UmE3, UmF4, UmF, UmF3, and UvF, refer to the Muskingum series.)	Fair to poor.	Poor	Poor	Moderate to high.	High	Instability; plastic clay; susceptible to slipping.

interpretations of soils—Continued

Soil features affecting—Continued							Construction and maintenance of pipelines
Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways		
Reservoir area	Embankments						
Flooding; pervious substratum; high water table.	Instability; erodibility; flooding.	Flooding; moderately slow permeability; high water table; lack of outlets.	High water table; moderately slow permeability; flooding.	High water table; flooding.	High water table; flooding.		High water table; flooding.
Sand lenses in substratum in some places; seasonal high water table.	Fair stability; seepage on top of fragipan; erodibility.	Moderately slow permeability; seasonal high water table.	Seasonal high water table; slow permeability.	Seepage on top of fragipan; erodibility.	Seepage on top of fragipan; erodibility.		Seasonal high water table.
Flooding; pervious substratum.	Flooding; fair stability.	Not needed	No undesirable features.	Not needed in most places.	Not needed in most places.		Flooding.
Pervious material; shallowness to pervious bedrock.	Fair stability; pervious material.	Not needed	Shallowness to bedrock; pervious substratum.	Shallowness to bedrock.	Shallowness to bedrock.		Shallowness to bedrock.
Pervious substratum; seasonal high water table.	Pervious substratum; fair stability.	Moderately slow permeability; seasonal high water table.	Moderately slow permeability.	No undesirable features.	No undesirable features.		Seasonal high water table.
Flooding; pervious substratum; seasonal high water table.	Flooding; fair stability.	Seasonal high water table; flooding.	Seasonal high water table; flooding.	Seasonal high water table; flooding.	Seasonal high water table; flooding.		Flooding.
Small seepage losses; shallowness to bedrock.	Fair stability; seepage on top of fragipan; erodibility.	Moderately slow permeability; seasonal high water table.	Moderately slow permeability; seasonal high water table.	Seepage on top of fragipan; erodibility.	Seepage on top of fragipan; erodibility.		Seasonal high water table.
Small seepage losses; seasonal high water table.	Instability; erodibility.	Slow permeability; seasonal high water table; subsurface drainage difficult.	Slow permeability; seasonal high water table.	Seasonal high water table.	Seasonal high water table.		Seasonal high water table.
Small seepage losses; susceptible to slipping.	Instability; plasticity.	Not needed	Slow permeability; rapid runoff.	Erodibility; susceptible to slipping.	Erodibility		Plastic clay; susceptible to slipping; shallowness to bedrock.

TABLE 5.—*Engineering*

Soils and map symbols	Suitability as a source of—		Suitability for winter grading	Susceptibility to frost action	Susceptibility to slippage	Soil features affecting—
	Topsoil	Road fill				Location of highways
Vandalia (VaB, VaC, VaC3, VaD, VaD3, VaE, VaE3, VdD, VdE, VsD4).	Fair	Fair to poor.	Poor	Moderate to high.	High	Instability; plastic clay; susceptible to slipping.
Wheeling (WeA, WeB, WeC, WhA, WhB, WhC).	Good	Good to fair.	Good	Low to moderate.	Low	No undesirable features.
Zoar (ZoB, ZoC, ZsC3, ZsD3)	Fair	Poor	Unsuitable	High	Moderate where slopes are more than 20 percent.	Seasonal high water table; instability; susceptible to slipping on steep slopes.

TABLE 6.—*Engineering*

[Tests performed by West Virginia University, in cooperation with the West Virginia State Road Commission and the Bureau

Soil name and location	Parent material	West Virginia University report No.	Depth	Moisture density [1]		Mechanical analysis [2]		
				Maximum dry density	Optimum moisture	Percentage passing sieve—		
						3 in.	¾ in.	No. 4 (4.7 mm.)
			Inches	*Lb. per cu. ft.*	*Percent*			
Lakin loamy sand:								
Wood County: 1.2 miles south of Washington on terrace of the Ohio River.	Wind-blown deposits (terrace).	A–1	0–10	108	11		100	99
		A–2	16–32	100	9			
		A–3	32–56	106	8			
		A–4	56–68	122	10		100	82
McGary silty clay loam:								
Wood County: 1 mile east of U.S. Highway No. 21 along State Route 14 (modal profile).	Slack water deposits (terrace).	A–5	0–8	90	23		100	99
		A–6	12–23	93	21			
		A–7	36–72	98	22			
Wood County: 1.4 miles east of Mt. Pleasant Church and 225 yards southwest of gravel road (poorly drained).	Slack water deposits (terrace).	A–8	1–6	86	25	100	95	87
		A–9	10–24	92	25			
		A–10	37–50	93	24			
Wood County: 325 yards south of State Route 47 and 1 mile east of Wirt County line (influenced by red shale).	Slack water deposits (terrace).	A–11	0–8	89	24		100	94
		A–12	23–35	97	20			
		A–13	41–62	106	15			
Muskingum silt loam:								
Wood County: 425 yards west of Ritchie County line and about 200 yards south of U.S. Highway No. 50 (modal profile).	Sandstone, siltstone, and shale.	A–14	3–8	103	18		100	84
		A–15	8–18	111	12	100	98	84
		A–16	18–26	116	13		100	76
Wirt County: 1.75 miles northwest of Elizabeth on State Route 14 (influenced by red shale).	Sandstone, siltstone, and shale.	A–20	2–9	101	19		100	86
		A–21	9–19	110	14		100	88
		A–22	19–27	112	13	100	87	67

See footnotes at end of table.

interpretations of soils—Continued

Soil features affecting—Continued						Construction and maintenance of pipelines
Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways	
Reservoir area	Embankments					
Small seepage losses; susceptible to slipping; may have pervious layers in substratum.	Instability	Not needed	Slow permeability; rapid runoff.	Erodibility	Erodibility	Plastic clay; susceptible to slipping.
Pervious gravel substratum.	Pervious gravel substratum.	Not needed	No undesirable features.	No undesirable features.	No undesirable features.	No special problem.
Small seepage losses; seasonal high water table.	Instability; erodibility.	Slow permeability; subsurface drainage difficult; seasonal high water table.	Slow permeability; seasonal high water table.	Seasonal high water table; erodibility.	Seasonal high water table; erodibility.	Seasonal high water table.

test data

of Public Roads, in accordance with standard procedures of the American Association of State Highway Officials (AASHO) (*2*)]

Mechanical analysis [2]—Continued							Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Con.			Percentage smaller than—							
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO [3]	Unified [4]
98	97	14	11	7	5	3	31	5	A-2-4(0)	SM
100	96	5	3	2	1	0	28	4	A-2-4(0)	SP-SC
100	95	7	5	2	0	0	29	5	A-2-4(0)	SP-SC
60	38	10	6	4	2	1	[5] NP	NP	A-1-b(0)	SP-SM
98	87	64	59	50	38	31	54	17	A-7-5(11)	MH
100	99	99	96	86	56	35	58	29	A-7-6(19)	MH-CH
----------	----------	99	95	93	75	53	51	22	A-7-6(15)	MH-CH
70	67	63	58	51	30	21	59	15	A-7-5(10)	MH
100	99	95	79	74	53	37	42	19	A-7-6(12)	CL
100	99	96	94	90	60	47	49	22	A-7-6(15)	ML-CL
90	58	31	28	21	13	10	45	10	A-2-5(0)	SM
100	99	93	90	80	60	48	57	25	A-7-5(17)	MH
100	97	86	82	72	46	32	38	14	A-6(10)	ML-CL
77	55	27	26	20	13	10	39	14	A-2-6(0)	SM-SC
72	64	44	41	35	17	6	26	6	A-4(2)	SM-SC
68	59	40	35	30	15	7	25	6	A-4(1)	SM-SC
72	64	55	51	41	21	12	36	9	A-4(4)	ML
84	74	67	62	53	29	14	32	8	A-4(6)	ML-CL
58	52	46	44	38	20	12	31	6	A-4(2)	GM

TABLE 6.—*Engineering*

Soil name and location	Parent material	West Virginia University report No.	Depth	Moisture density [1]: Maximum dry density	Moisture density [1]: Optimum moisture	Mechanical analysis [2] — Percentage passing sieve—: 3 in.	¾ in.	No. 4 (4.7 mm.)
Muskingum silt loam—Continued			*Inches*	*Lb. per cu. ft.*	*Percent*			
Wood County: In the Sand Hill area along U.S. Highway No. 50 and 25 yards east of power line right-of-way (coarser textured than modal).	Sandstone, siltstone, and shale.	A–17	1–5	105	16	100	79	69
		A–18	9–16	114	14	----------	100	82
		A–19	16–26	115	13	100	89	72
Upshur silty clay:								
Wood County: 1.75 miles southeast of Boaz and 0.25 mile southwest of Kellar Lane.	Shale.	A–23	0–7	96	23	----------	----------	----------
		A–24	16–31	96	26	----------	----------	----------
		A–25	54–73	110	14	100	98	81
Wirt County: 1 mile northwest of Cherry and 1.3 miles northeast of State Route 5 (modal profile in Upshur-Muskingum complexes).	Shale.	A–26	0–6	99	18	----------	100	99
		A–27	19–32	99	20	----------	----------	100
		A–28	42–54	106	18	----------	100	97
Wood County: 1 mile northeast of Rockport (shaly lower horizons; moderately deep).	Shale.	A–29	0–5	91	18	----------	100	97
		A–30	5–19	101	21	----------	100	99
		A–31	24–32	113	12	----------	100	99
Vandalia silty clay loam:								
Wood County: 1 mile southeast of Leachtown and 175 yards north of State Route 47 (modal profile).	Colluvium.	A–32	0–7	94	24	----------	100	90
		A–33	14–27	99	23	----------	100	94
		A–34	46–72	111	15	----------	100	98
Wirt County: 0.75 mile west of Elizabeth and 2 miles west of State Route 14, on Tucker Creek road (coarser textured than modal).	Colluvium.	A–38	0–7	98	17	100	72	65
		A–39	14–27	102	19	----------	100	94
		A–40	36–48	102	19	----------	100	99
Vandalia very stony silty clay loam:								
Wirt County: 2 miles southwest of Elizabeth on State Route 14.	Colluvium.	A–35	0–9	102	16	100	90	80
		A–36	19–35	95	23	100	80	76
		A–37	40–55	105	19	100	98	76

[1] Based on AASHO Designation: T 99–57, Method C (*2*).
[2] Mechanical analyses according to the AASHO Designation: T 88 (*2*). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses data used in this table are not suitable for use in naming textural classes for soil.

Shrink-swell potential indicates the volume change to be expected with a change in moisture content. Ratings are *low*, *moderate*, and *high*. They were estimated primarily on the basis of the amount and kind of clay that soil contains. The shrink-swell potential is low in soils that are not sticky and have low plasticity; soils classified as ML or A–4 are of this kind. Generally, soils classified as CH or A–7 have a high shrink-swell potential; sticky and plastic clay soils that crack when dry have a high shrink-swell potential.

Engineering interpretations of soils

In table 5, the soils of Wood and Wirt Counties are rated according to their suitability for winter grading, susceptibility to frost action and to slippage, and suitability as a source of topsoil and road fill. In addition, the table lists soil features that affect the location of highways and the construction and maintenance of farm ponds, drainage systems, irrigation systems, diversion terraces, waterways, and pipelines.

The suitability of the soils in the two counties as a source of sand and gravel is not given in table 5, though the Lakin soils are a good source of sand, and the substratum of the Lakin and Wheeling soils is an excellent source of both sand and gravel.

Suitability of soil material as a source of topsoil and of road fill is rated *good*, *fair*, or *poor*. Soils rated good as a source of topsoil are naturally fertile, are moderately permeable, have a moderate to high moisture-holding capacity, are easily vegetated, and are not easily eroded.

test data—Continued

Mechanical analysis [2]—Continued							Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Con.			Percentage smaller than—						AASHO [3]	Unified [4]
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
61	56	38	33	27	9	2	30	7	A-4(1)	SM-SC
67	46	23	21	16	10	8	27	5	A-1-b(0)	SM-SC
70	63	34	31	25	13	6	25	2	A-2-4(0)	SM
100	97	92	90	77	45	22	56	22	A-7-5(16)	MH
100	99	99	94	85	65	33	64	39	A-7-6(20)	CH
67	60	54	47	38	16	9	39	12	A-6(5)	ML-CL
99	96	92	90	82	51	37	45	16	A-7-6(11)	ML
99	99	99	95	83	50	26	57	24	A-7-5(17)	MH
96	95	94	88	75	39	20	53	23	A-7-5(16)	MH-CH
96	88	80	77	62	22	7	53	17	A-7-5(13)	MH
99	98	96	95	84	54	41	53	22	A-7-5(15)	MH
99	97	94	86	71	36	18	42	17	A-7-6(11)	ML-CL
85	76	65	57	44	19	6	51	13	A-7-5(12)	MH
92	87	82	80	68	43	27	53	25	A-7-6(17)	MH-CH
98	97	93	86	80	60	43	38	18	A-6(11)	CL
60	50	37	33	26	11	3	40	7	A-4(0)	GM
90	84	77	75	65	35	22	45	20	A-7-6(13)	ML-CL
99	97	91	90	84	66	53	57	28	A-7-6(19)	MH-CH
71	63	56	47	39	20	7	52	19	A-7-5(9)	MH
73	71	68	65	61	46	32	49	22	A-7-6(13)	ML-CL
69	62	55	46	41	24	17	46	24	A-7-6(10)	CL

[3] Based on AASHO Designation: M 145-49 (*2*).
[4] Based on the Unified Soil Classification System, Tech. Memo. No. 3-357, v. 1, Corps of Engineers (*15*). SCS and BPR have agreed to consider that all soils having plasticity indexes within two points of A-line are to be given a borderline classification. Examples of a borderline classification obtained by this use is SP-SM and MH-CH.
[5] Nonplastic.

Considered in rating the soils as a source of material for road fill are shrink-swell potential, compactibility, erodibility, and depth to bedrock.

Suitability of soils for winter grading is greatly affected by shrink-swell potential and a high water table. Upshur, Vandalia, and other soils that have a high shrink-swell potential are poorly suited to winter grading. Ginat, Melvin, and other soils that have a seasonal high water table are unsuitable for winter grading. Wheeling soils are rated good for winter grading because they have low shrink-swell potential and a gravelly substratum.

In table 5, the soils are rated *low*, *moderate*, and *high* according to their susceptibility to frost action. The ratings are based on the texture and natural drainage of the soil. Soils that have a high content of silt are the most susceptible to damaging frost action because they are more likely to heave as a result of freezing and thawing.

Susceptibility of soil material to slippage is rated *low*, *moderate*, or *high*. The soils most susceptible to slippage are steep, have a high content of clay, or a perched water table. The hazard of slippage is more severe in the Upshur and Vandalia soils than in the other soils of the two counties.

The location of highways is affected by flooding, shrink-swell potential, compactibility, slippage of soil material, depth to bedrock, and height of the water table. Because soils in the hilly areas are mostly fine textured and steep, slippage is a very severe hazard in these areas.

Most of the farm ponds in Wood and Wirt Counties are of the impoundment type. Where farm ponds are constructed, therefore, the soils must be suitable for both reservoir areas and for use in embankments. Soil features affecting use of soils for farm ponds are the sealing potential of the soil material, layers of sand, a high water table, depth to bedrock, stability, permeability, and susceptibility to seepage, slippage, and flooding. Soils that are sandy or are underlain by sand and gravel, and those that are shallow to pervious bedrock, are generally not suited or are poorly suited for farm ponds.

Soil features affecting agricultural drainage are permeability, a high water table, flooding, and availability of outlets. Generally, the moderately well drained soils need only spot drainage, but most of the somewhat poorly drained and poorly drained soils need both surface and subsurface drainage. Subsurface drainage is difficult on the Tygart and other soils that have a fine-textured, slowly permeable subsoil.

Some of the features considered in evaluating a soil for irrigation purposes are natural drainage, permeability, level of the water table, water-holding capacity, flooding, depth to bedrock, and rate of runoff. The soils that are the most suitable for irrigation are well drained, are nearly level to gently sloping, are moderately permeable, and have a moderate to high water-holding capacity. Lakin soils require frequent applications of water because they are very rapidly permeable and have a very low water-holding capacity.

Terraces, diversions, and waterways are affected by slope, permeability, erodibility, stability, susceptibility to slippage, seepage, height of water table, flooding, availability of suitable outlets, and depth to bedrock.

Some soil features affecting the construction and maintenance of pipelines are corrosion potential, flooding, kind of bedrock, depths between which the water table fluctuates, slippage, and depth to bedrock. In table 5, a rating of *low*, *moderate*, or *high* is given to indicate the effect that solvents in a soil have on the corrosion of steel and concrete pipes.

Soil test data

To help evaluate the soils for engineering purposes, samples were taken from the soils of the Lakin, McGary, Muskingum, Upshur, and Vandalia series and were tested in accordance with standard procedures of the American Association of State Highway Officials (AASHO). The results of these tests and the classification of each sample according to both the AASHO and Unified systems are given in table 6.

TABLE 7.—*Estimated degree and kinds of limitations*

[Made land (Ma) and Steep land, alluvial

Soil and map symbols	Sites for buildings of 3 stories or less	Disposal of sewage effluent (septic tank drainage fields)	Impoundments and sewage lagoons	Lawns
Allen:				
AeB	Slight	Moderate: Slope	Severe: Pervious substratum.	Slight
AeC, AeC3	Moderate: Slope	Severe: Slope; pervious substratum may result in pollution of nearby sources of water.	Severe: Pervious substratum; slope.	Moderate: Slope
AeD3	Severe: Slope	Severe: Slope	Severe: Pervious substratum.	Severe: Slope
Ashton:				
AsA, AsB	Severe: Hazard of flooding.	Moderate: Slope; hazard of flooding.	Moderate: Pervious substratum; hazard of flooding.	Slight
Brooke	Severe: Clayey; hazard of slippage; shallowness to bedrock.	Severe: Moderately slow permeability; slope.	Severe: Slope; hazard of slippage.	Severe: Clayey; hazard of slippage.
Cotaco:				
CoA, CoB	Moderate: Seasonal high water table.	Severe: Moderately slow permeability; seasonal high water table.	Moderate: Sandy layers.	Slight
CoC	Moderate: Seasonal high water table.	Severe: Moderately slow permeability; seasonal high water table; slope.	Severe: Slope; sandy layers.	Moderate: Slope

See footnote at end of table.

The engineering soil classifications in table 6 are based on data obtained by mechanical analyses and by tests to determine liquid limit and plastic limit. The mechanical analyses were made by the combined sieve and hydrometer methods. The percentage of clay obtained by the hydrometer method should not be used in naming the textural classes of soils.

Moisture density, the relation of moisture content and the density to which a soil material is compacted, is given in table 6. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, the density decreases with increase in moisture. The highest dry density obtained in the compaction test is termed maximum dry density. Moisture-density data are important in earthwork, for as a rule, optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

The liquid limit and plasticity index given in table 6 indicate the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Recreational and Nonfarm Uses of Soils

In recent years industrial expansion of the Ohio Valley has created many new jobs and attracted people from adjacent areas. This influx of people has increased recreational and housing needs. Housing has about kept pace with the expanding population, but recreational facilities have developed slowly and are still in great demand.

Because many of the soils along the Ohio River in Wood County are well situated and have good physical properties, they are in greatest demand for industrial and housing developments. Thus, it may be necessary to locate many recreational facilities on soils in other areas. Most soils in the two counties have properties that limit suitability for recreational and nonfarm uses. The estimated degree and kinds of soil limitations for these uses are given in table 7.

for recreational and nonfarm uses of soils

materials (StF) are not rated in this table.]

Extensive play areas	Athletic fields	Streets and parking lots	Access roads	Campsites	
				Tents	Trailers
Slight	Moderate: Slope	Moderate: Slope	Moderate: Slope	Slight	Moderate: Slope.
Moderate: Slope	Severe: Slope	Severe: Slope	Moderate: Slope	Moderate: Slope	Severe: Slope.
Severe: Slope	Severe: Slope	Severe: Slope	Severe: Slope	Severe: Slope	Severe: Slope.
Slight	Slight	Moderate: Hazard of flooding.	Slight	Moderate: Hazard of flooding; slope.	Moderate: Hazard of flooding; slope.
Severe: Clayey; slope.	Severe: Clayey; very slowly permeable; shallowness to bedrock.	Severe: Slope; hazard of slippage; shallowness to bedrock.	Severe: Slope; hazard of slippage; shallowness to bedrock.	Severe: Clayey; slope.	Severe: Clayey; slope.
Slight	Moderate: Seasonal high water table; moderately slow permeability.	Moderate: Seasonal high water table.	Moderate: Seasonal high water table.	Moderate: Seasonal high water table; moderately slow permeability.	Moderate: Seasonal high water table; moderately slow permeability.
Moderate: Seasonal high water table.	Severe: Slope; seasonal high water table; moderately slow permeability.	Severe: Slope; seasonal high water table.	Moderate: Seasonal high water table; slope.	Moderate: Seasonal high water table; moderately slow permeability.	Severe: Slope; seasonal high water table; moderately slow permeability.

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TABLE 7.—*Estimated degree and kinds of limitations*

Soil and map symbols	Sites for buildings of 3 stories or less	Disposal of sewage effluent (septic tank drainage fields)	Impoundments and sewage lagoons	Lawns
Duncannon:				
DuB	Slight	Moderate: Slope	Severe: Pervious substratum; unstable fill material.	Slight
DuC	Moderate: Slope	Severe: Slope	Severe: Pervious substratum; unstable fill material when saturated; slope.	Moderate: Slope
DuD, DuE	Severe: Slope	Severe: Slope	Severe: Pervious substratum; unstable fill material; slope.	Severe: Slope
Ginat:				
Gn	Severe: High water table.	Severe: High water table.	Severe: Pervious substratum.	Severe: High water table.
Hackers:				
HaA, HaB, HcA, HcB	Severe: Hazard of flooding.	Moderate: Hazard of flooding; slope.	Moderate: Pervious substratum; hazard of flooding.	Slight
HaC, HcC	Severe: Hazard of flooding; slope.	Severe: Hazard of flooding; slope.	Severe: Slope; pervious substratum.	Moderate: Slope
HcD	Severe: Slope; hazard of flooding.	Severe: Slope; hazard of flooding.	Severe: Slope; pervious substratum.	Severe: Slope
Huntington:				
Hf, HnA, HnB	Severe: Hazard of flooding.	Severe: Hazard of flooding.	Severe: Sandy layers; pervious substratum.	Slight
Ht	Severe: Hazard of flooding.	Severe: Hazard of flooding.	Severe: Pervious substratum; hazard of flooding.	Severe: Hazard of flooding; deposition.
Lakin:				
LaB, LkB	Slight	Slight [1]	Severe: Very rapid permeability.	Severe: Droughtiness.
LkC	Moderate: Slope	Severe: Slope; pervious substratum.[1]	Severe: Slope; very rapid permeability.	Severe: Droughtiness; slope.
LkD	Severe: Slope	Severe: Slope; pervious substratum.[1]	Severe: Slope; very rapid permeability.	Severe: Droughtiness; slope.
Lindside:				
Ln	Severe: Hazard of flooding; seasonal high water table.	Severe: Hazard of flooding; seasonal high water table.	Moderate: Pervious substratum; hazard of flooding.	Slight
Markland:				
MdB	Moderate: Seasonal high water table.	Severe: Slow permeability; seasonal high water table.	Moderate: Slope	Slight
MdC, MeC3	Moderate: Seasonal high water table.	Severe: Slope; slow permeability.	Severe: Slope	Moderate: Slope
MdE, MeD3, MeE3	Severe: Seasonal high water table; slope; clayey; hazard of slippage.	Severe: Slope; slow permeability.	Severe: Slope	Severe: Slope; clayey.

See footnote at end of table.

for recreational and nonfarm uses of soils—Continued

Extensive play areas	Athletic fields	Streets and parking lots	Access roads	Campsi es	
				Tents	Trailers
Slight	Moderate: Slope	Moderate: Slope	Moderate: Slope	Slight	Moderate: Slope.
Moderate: Slope	Severe: Slope	Severe: Slope	Moderate: Slope	Moderate: Slope	Severe: Slope.
Severe: Slope	Severe: Slope	Severe: Slope	Severe: Slope	Severe: Slope	Severe: Slope.
Severe: High water table.	Severe: High water table.	Severe: High water table.	Severe: High water table.	Severe: High water table.	Severe: High water table.
Slight	Slight	Moderate: Hazard of flooding.	Slight	Moderate: Hazard of flooding.	Moderate: Hazard of flooding.
Moderate: Slope	Severe: Slope	Severe: Slope; hazard of flooding.	Severe: Slope	Severe: Slope	Severe: Slope.
Severe: Slope	Severe: Slope	Severe: Slope; hazard of flooding.	Severe: Slope	Severe: Slope	Severe: Slope.
Moderate: Hazard of flooding.	Moderate: Hazard of flooding.	Moderate: Hazard of flooding.	Slight	Severe: Hazard of flooding.	Severe: Hazard of flooding.
Severe: Hazard of flooding.	Severe: Hazard of flooding.	Severe: Hazard of flooding.	Severe: Hazard of flooding.	Severe: Hazard of flooding.	Severe: Hazard of flooding.
Moderate: Droughtiness; difficult to maintain turf.	Moderate: Slope; difficult to maintain turf.	Moderate: Slope	Slight	Moderate: Slope	Moderate: Slope.
Moderate: Slope; difficult to maintain turf.	Severe: Slope; difficult to maintain turf.	Severe: Slope	Moderate: Slope	Moderate: Slope	Severe: Slope.
Severe: Slope; difficult to maintain turf.	Severe: Slope; difficult to maintain turf.	Severe: Slope	Severe: Slope	Severe: Slope	Severe: Slope.
Moderate: Seasonal high water table.	Moderate: Seasonal high water table.	Severe: Hazard of flooding.	Moderate: Seasonal high water table.	Severe: Seasonal high water table; hazard of flooding.	Severe: Seasonal high water table; hazard of flooding.
Moderate: Seasonal high water table.	Moderate: Seasonal high water table; slow permeability; slope.	Moderate: Slope; seasonal high water table.	Moderate: Seasonal high water table; slope.	Moderate: Seasonal high water table; slow permeability.	Moderate: Seasonal high water table; slow permeability.
Moderate: Seasonal high water table; slope.	Severe: Slope; seasonal high water table.	Severe: Slope; seasonal high water table.	Moderate: Slope; seasonal high water table.	Moderate: Slope; slow permeability.	Severe: Slope.
Severe: Slope; seasonal high water table.	Severe: Slope	Severe: Slope; hazard of slippage.	Severe: Slope; hazard of slippage.	Severe: Slope; clayey	Severe: Slope; clayey.

TABLE 7.—*Estimated degree and kinds of limitations*

Soil and map symbols	Sites for buildings of 3 stories or less	Disposal of sewage effluent (septic tank drainage fields)	Impoundments and sewage lagoons	Lawns
McGary:				
Mg	Severe: Seasonal high water table.	Severe: Seasonal high water table; slow permeability.	Slight	Severe: Seasonal high water table; slow permeability; clayey.
Melvin:				
Ml	Severe: High water table; hazard of flooding.	Severe: High water table; hazard of flooding.	Moderate: Possible sandy layers; hazard of flooding.	Severe: High water table; hazard of flooding.
Monongahela and Tilsit:				
MnA, MnB	Moderate: Seasonal high water table; shallowness to bedrock on Tilsit soil.	Severe: Moderately slow permeability in fragipan; slope.	Moderate: Sandy layers in some areas; shallowness to bedrock on Tilsit soil.	Slight
MnC, MnC3	Moderate: Seasonal high water table; shallowness to bedrock on Tilsit soil.	Severe: Slow permeability in fragipan; slope.	Severe: Slope; sandy layers in some areas; shallowness to bedrock on Tilsit soil.	Moderate: Slope; seep spots in some places.
MnD, MnD3	Severe: Seasonal high water table; slope; shallowness to bedrock on Tilsit soil.	Severe: Slow permeability in fragipan; slope.	Severe: Slope; sandy layers in some areas; shallowness to bedrock on Tilsit soil.	Severe: Slope; seep spots in some areas.
Moshannon:				
MoA, MoB, Mt	Severe: Hazard of flooding.	Severe: Hazard of flooding.	Severe: Hazard of flooding; pervious substratum.	Moderate: Hazard of flooding.
Ms	Severe: Seasonal high water table; hazard of flooding.	Severe: Seasonal high water table; hazard of flooding.	Severe: Hazard of flooding; pervious substratum.	Severe: Hazard of flooding; seasonal high water table.
Muskingum:				
MuC, MuC3	Moderate: Shallowness to bedrock.	Severe: Slope	Severe: Slope; pervious substratum.	Moderate: Slope; stone fragments.
MuD, MuD3, MuE, MuF3, MuF	Severe: Shallowness to bedrock; slope.	Severe: Slope; shallowness to bedrock.	Severe: Slope; pervious substratum.	Severe: Slope; stoniness.
Sciotoville:				
ScA, ScB	Moderate: Seasonal high water table.	Severe: Moderately slow permeability; seasonal high water table; slope.	Severe: Pervious substratum.	Slight
Senecaville:				
Se	Severe: Hazard of flooding.	Severe: Hazard of flooding; seasonal high water table; pervious substratum.	Severe: Pervious substratum; hazard of flooding.	Slight
Sn	Severe: Hazard of flooding.	Severe: Hazard of flooding; seasonal high water table; pervious substratum.	Severe: Pervious substratum; hazard of flooding.	Severe: Hazard of flooding.
Tygart:				
Ty	Severe: Seasonal high water table.	Severe: Seasonal high water table; slow permeability.	Slight	Severe: Seasonal high water table; slow permeability.

See footnote at end of table.

for recreational and nonfarm uses of soils—Continued

Extensive play areas	Athletic fields	Streets and parking lots	Access roads	Campsites	
				Tents	Trailers
Severe: Seasonal high water table; slow permeability.	Severe: Seasonal high water table; slow permeability.	Severe: Seasonal high water table.	Severe: Seasonal high water table.	Severe: Seasonal high water table.	Severe: Seasonal high water table.
Severe: High water table.	Severe: High water table.	Severe: High water table; hazard of flooding.	Severe: High water table.	Severe: High water table.	Severe: High water table.
Slight	Moderate: Seasonal high water table; moderately slow permeability in fragipan.	Moderate: Seasonal high water table.	Moderate: Seasonal high water table.	Moderate: Seasonal high water table; moderately slow permeability in fragipan.	Moderate: Seasonal high water table; moderately slow permeability in fragipan.
Moderate: Seasonal high water table; slope.	Severe: Slope; seasonal high water table; slow permeability in fragipan.	Severe: Slope; seasonal high water table.	Moderate: Seasonal high water table; slope.	Moderate: Seasonal high water table; slow permeability in fragipan; slope.	Severe: Slope; seasonal high water table.
Severe: Slope; seasonal high water table.	Severe: Slope; seasonal high water table; slow permeability in fragipan.	Severe: Slope; seasonal high water table.	Severe: Slope; seasonal high water table.	Severe: Slope; seasonal high water table; slow permeability in fragipan.	Severe: Slope; seasonal high water table; slow permeability in fragipan.
Moderate: Hazard of flooding.	Moderate: Hazard of flooding.	Severe: Hazard of flooding.	Severe: Hazard of flooding.	Severe: Hazard of flooding.	Severe: Hazard of flooding.
Severe: Hazard of flooding.	Severe: Hazard of flooding.	Severe: Hazard of flooding; seasonal high water table.	Severe: Hazard of flooding.	Severe: Hazard of flooding.	Severe: Hazard of flooding.
Moderate: Slope	Severe: Slope	Severe: Slope; shallowness to bedrock.	Moderate: Slope; shallowness to bedrock.	Moderate: Slope	Severe: Shallowness to bedrock; slope.
Severe: Slope	Severe: Slope; shallowness to bedrock.	Severe: Slope; shallowness to bedrock.	Severe: Slope; shallowness to bedrock.	Severe: Slope	Severe: Shallowness to bedrock; slope.
Slight	Moderate: Seasonal high water table; slow permeability.	Moderate: Seasonal high water table.	Moderate: Seasonal high water table.	Moderate: Seasonal high water table.	Moderate: Seasonal high water table.
Moderate: Hazard of flooding; seasonal high water table.	Moderate: Hazard of flooding; seasonal high water table.	Severe: Hazard of flooding; seasonal high water table.	Moderate: Hazard of flooding; seasonal high water table.	Severe: Hazard of flooding; seasonal high water table.	Severe: Hazard of flooding; seasonal high water table.
Severe: Hazard of flooding; seasonal high water table.	Severe: Hazard of flooding; seasonal high water table.	Severe: Hazard of flooding; seasonal high water table.	Severe: Seasonal high water table; hazard of flooding.	Severe: Seasonal high water table; hazard of flooding.	Severe: Seasonal high water table; hazard of flooding.
Severe: Seasonal high water table; slow permeability.	Severe: Seasonal high water table; slow permeability.	Severe: Seasonal high water table.	Severe: Seasonal high water table.	Severe: Seasonal high water table.	Severe: Seasonal high water table.

TABLE 7.—*Estimated degree and kinds of limitations*

Soil and map symbols	Sites for buildings of 3 stories or less	Disposal of sewage effluent (septic tank drainage fields)	Impoundments and sewage lagoons	Lawns
Upshur:				
UcB, UmB	Severe: Clayey; hazard of slippage.	Severe: Slow permeability; slope.	Moderate: Slope; hazard of slippage.	Moderate: Clayey
UcC, UcD, UdC3, UdD3, UeC, UeD, UhC3, UhD3, UhD4, UmC, UmC3, UmD, UmD3, UmD4, UmE, UmE3, UmF4, UmF, UmF3, UvF. (Limitations to use of Brooke soils in mapping units UeC, UeD, UhC3, UhD3, and UhD4 and of Muskingum soils in mapping units UmB, UmC, UmC3, UmD, UmD3, UmD4, UmE, UmE3, UmF4, UmF, UmF3, and UvF are the same as for Upshur.)	Severe: Clayey; hazard of slippage; shallowness to bedrock.	Severe: Slow permeability; slope.	Severe: Slope; hazard of slippage.	Severe: Clayey; hazard of slippage.
Vandalia:				
VaB	Moderate: Clayey; hazard of slippage; seepage.	Severe: Slow permeability; slope.	Moderate: Slope	Moderate: Clayey
VaC, VaC3	Severe: Clayey; hazard of slippage; seepage.	Severe: Slow permeability; slope.	Severe: Slope; hazard of slippage.	Severe: Clayey; slope; hazard of slippage.
VaD, VaD3, VaE, VaE3, VdD, VdE, VsD4.	Severe: Hazard of slippage; slope; clayey.	Severe: Slow permeability; slope.	Severe: Slope; hazard of slippage.	Severe: Clayey; slope; hazard of slippage.
Wheeling:				
WeA, WhA	Slight	Slight [1]	Severe: Gravelly substratum.	Slight
WeB, WhB	Slight	Moderate: Slope [1]	Severe: Gravelly substratum.	Slight
WeC, WhC	Moderate: Slope	Severe: Slope; pervious substratum.[1]	Severe: Gravelly substratum; slope.	Moderate: Slope
Zoar:				
ZoB	Moderate: Seasonal high water table.	Severe: Slow permeability; seasonal high water table.	Moderate: Slope	Slight
ZoC, ZsC3	Moderate: Seasonal high water table.	Severe: Slow permeability; seasonal high water table.	Severe: Slope	Moderate: Slope
ZsD3	Severe: Seasonal high water table; slope; clayey; hazard of slippage.	Severe: Slope; slow permeability.	Severe: Slope	Severe: Slope; clayey.

[1] Possible contamination of ground water because of the rapidly permeable substratum.

Limitations of the soils are rated *slight*, *moderate*, or *severe*. If the rating is moderate or severe, the main limiting property or properties are given. Among these properties are slope, hazard of flooding, seasonal high water table, permeability, depth to bedrock, presence of a fragipan, and hazard of slippage. The importance of a soil property may be different for one nonfarm use than it is for another. For example, a fine-textured soil is generally suited to use for water impoundment but is poorly suited to use for septic tank filter fields. Flooding is generally less restrictive for recreational use than for homesites and related uses. The hazard of flooding for a particular mapping unit may vary significantly from place to place along streams. The history of flooding at proposed sites should be carefully studied before buildings or other facilities are planned. The rating of limitations in table 7 does not eliminate the need for careful onsite investigations.

Discussed in the following paragraphs are the soil properties considered in rating the limitations to each of the nonfarm uses given in table 7.

Building Sites.—These buildings are three stories or less and have a basement 8 feet below the surface. The major features considered in rating limitations to use of the soils as sites for buildings are depth to bedrock, degree

for recreational and nonfarm uses of soils—Continued

Extensive play areas	Athletic fields	Streets and parking lots	Access roads	Campsites	
				Tents	Trailers
Moderate: Clayey	Severe: Clayey; slow permeability.	Severe: Slope; clayey; hazard of slippage.	Moderate: Slope; hazard of slippage.	Severe: Clayey; slope.	Severe: Clayey; slope.
Severe: Clayey; slope.	Severe: Clayey; slow permeability; slope; shallowness to bedrock.	Severe: Slope; hazard of slippage; shallowness to bedrock.	Severe: Slope; hazard of slippage; shallowness to bedrock.	Severe: Clayey; slope.	Severe: Clayey; slope.
Moderate: Clayey	Severe: Clayey; slow permeability.	Severe: Slope; hazard of slippage.	Moderate; Slope; hazard of slippage.	Moderate: Clayey; slope.	Moderate: Clayey; slope.
Severe: Clayey; slope.	Severe: Clayey; slope.	Severe: Slope; hazard of slippage.	Moderate: Slope; hazard of slippage.	Moderate: Clayey; slope.	Severe: Slope; clayey.
Severe: Clayey; slope.	Severe: Clayey; slope.	Severe: Slope; hazard of slippage.	Severe: Slope; hazard of slippage.	Severe: Clayey; slope.	Severe: Clayey; slope.
Slight	Slight	Slight	Slight	Slight	Slight.
Slight	Moderate: Slope	Moderate: Slope	Slight	Slight	Moderate: Slope.
Moderate: Slope	Severe: Slope	Severe: Slope	Moderate: Slope	Moderate: Slope	Severe: Slope.
Moderate: Seasonal high water table.	Moderate: Seasonal high water table; slope; slow permeability.	Moderate: Slope; seasonal high water table.	Moderate: Seasonal high water table; slope.	Moderate: Seasonal high water table; slope; slow permeability.	Moderate: Seasonal high water table; slope; slow permeability.
Moderate: Seasonal high water table; slope.	Severe: Slope; seasonal high water table.	Severe: Slope; seasonal high water table.	Moderate: Slope; seasonal high water table.	Moderate: Slope; slow permeability.	Severe: Slope.
Severe: Slope; seasonal high water table.	Severe: Slope	Severe: Slope; seasonal high water table.	Severe: Slope; hazard of slippage.	Severe: Slope; clayey.	Severe: Slope; clayey.

of slope, depth to the water table, and hazard of flooding and slippage. Not considered is a method for disposing of sewage. For buildings without basements, the depth to bedrock is not so important.

Disposal of Sewage Effluent.—The suitability of a soil for disposing effluent from septic tanks depends on slope, depth to a high water table, permeability, hazard of flooding and slippage, and depth to bedrock. Disposing of effluent from septic tanks is difficult on soils that are clayey, slowly permeable, have a high water table, or are subject to flooding. In table 7, a rating of slight means that the soil generally is well suited to use as filter fields for septic tanks. A rating of moderate means that the suitability of the soil is less than that of the soil rated slight and that larger areas generally are needed for disposal fields. Before a septic tank system is installed on soils rated severe, an investigation should be made at the proposed site to determine the condition of the soil. Soils that are rated severe may be unsuitable for use as disposal fields.

Impoundments and Sewage Lagoons.—Impoundments generally are more than one-half acre in size and are used for swimming, fishing, ice skating, and similar kinds of recreation.

Sewage lagoons are shallow ponds built to dispose of sewage through oxidation. They may be needed in an area where installations of septic tanks or a central sewage system is not feasible or practical. Among the features that affect the degree of limitation are depth to and kind of bedrock, permeability, hazard of flooding and slippage, degree of slope, and stability of fill material. Sandy soils or soils that are underlain by sand and gravel and soils that are shallow to bedrock have severe limitations to use as impoundments and sewage lagoons.

Lawns.—Among the soil properties that determine whether or not a good lawn can be established or maintained are texture and depth of surface soil, degree of slope, depth to the water table, stoniness, droughtiness, and the hazard of flooding. The most desirable areas are those where lawns can be established and maintained with only additions of lime and fertilizer.

Extensive Play Areas.—These are fairly large areas used for picnicking and similar recreational activities. These areas are essentially left in their natural state. The soil properties that affect use for extensive play areas are slope, soil texture, a high water table, and the hazard of flooding. A soil having moderate limitations to use for extensive play areas may have severe limitations to use for athletic fields, as for example, Duncannon silt loam, 10 to 20 percent slopes.

Athletic Fields.—These are generally small areas used for football, baseball, and other games. Because nearly level areas are needed, considerable grading and shaping are required in most places. Soils that have a clayey, gravelly, or stony surface layer are severely limited. Other properties that affect the suitability of a soil for athletic fields are soil depth, slope, depth to the water table, and the hazard of flooding.

Streets and Parking Lots.—The soil requirements and limitations for streets and parking lots are similar to those for highways (see tables 4 and 5 in the section "Engineering Uses of Soils" in this survey). Table 4 shows the depth to a seasonal high water table, depth to bedrock, and the shrink-swell potential for most of the soils in the two counties. Table 5 shows the suitability of the soils for road fill, the limitations that affect the location of highways, and the susceptibility to frost action. Other factors affecting the degree of limitation are slope and the hazard of flooding.

Access Roads.—Access roads carry light to medium traffic to and between recreational areas, buildings, and homesites. Soil features affecting the degree of limitation are soil depth, stoniness, depth to the water table, slope, and the hazard of flooding and of slippage. Slope and depth to bedrock are less serious limitations for access roads than for streets and parking lots. Table 4 in this survey shows the depth to a seasonal high water table, depth to bedrock, and shrink-swell potential for most of the soils in the two counties. Table 5 shows the suitability of the soils for road fill, the limitations that affect the locations of highways, and the susceptibility to frost action.

Campsites.—Sites used for tents and trailers should be level and large enough to provide privacy and to include picnic tables, fireplaces, and parking areas. For tents, the limitations are generally less severe than for trailers. Properties to consider when selecting campsites are slope, natural drainage, and soil texture.

Descriptions of the Soils

This section describes the soil series and mapping units in Wood and Wirt Counties. The approximate acreage and proportionate extent of each mapping unit are given in table 8.

The procedure in this section is first to describe the soil series and then the mapping units in the series. Thus, to get full information on any one mapping unit, it is necessary to read the description of the unit and also the description of the soil series to which it belongs. The description of a soil series mentions features that apply to all the soils in the series. Differences among the soils of one series are pointed out in the descriptions of the individual soils or are indicated in the soil name. Unless otherwise stated, the descriptions of all mapping units in this section are for moist soils. As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. For example, Made land is a miscellaneous land type and does not belong to a soil series; nevertheless, it is listed in alphabetical order along with the series.

An essential part of each soil series is the description of the soil profile, the sequence of layers beginning at the surface and continuing downward to the depth beyond which roots of most plants do not penetrate. Each soil series contains both a brief nontechnical and a detailed technical description of the soil profile. The nontechnical description will be useful to most readers. The detailed technical description is included for soil scientists, engineers, and others who need to make thorough and precise studies of soils.

Following the name of each mapping unit, there 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 in which the mapping unit has been placed. The page on which each capability unit is described can be found by referring to the "Guide to Mapping Units" at the back of this soil survey. Many terms used in the soil descriptions and other sections of this survey are defined in the Glossary at the back of this soil survey and in the "Soil Survey Manual" (*10*).

Allen Series

The Allen series consists of deep, well-drained soils on terraces. These soils developed in old alluvium washed from soils that formed on acid sandstone and shale. In Wood and Wirt Counties these soils occur mainly in the vicinity of Leachtown, Pettyville, Butcher Bend, Elizabeth, and Palestine. Slopes range from about 3 to 30 percent, but slopes of 8 to 15 percent are dominant.

In a typical profile the surface layer consists of loam and is about 11 inches thick. It is dark brown in the upper 6 inches and dark yellowish brown below. The subsoil extends to a depth of 48 inches. It is yellowish-red, friable loam in the upper 7 inches and yellowish-red, firm clay

TABLE 8.—*Approximate acreage and proportionate extent of the soils*

Mapping unit	Wood County		Wirt County		Total	
	Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Allen loam, 3 to 10 percent slopes	170	0.1			170	[1]
Allen loam, 10 to 20 percent slopes	580	.2	420	0.3	1,000	0.2
Allen loam, 10 to 20 percent slopes, severely eroded	90	[1]	80	.1	170	[1]
Allen loam, 20 to 30 percent slopes, severely eroded	10	[1]	100	.1	110	[1]
Ashton silt loam, 0 to 3 percent slopes	410	.2			410	.1
Ashton silt loam, 3 to 10 percent slopes	260	.1			260	.1
Cotaco silt loam, 0 to 3 percent slopes	100	[1]	440	.3	540	.2
Cotaco silt loam, 3 to 10 percent slopes	310	.1	680	.5	990	.2
Cotaco silt loam, 10 to 20 percent slopes	80	[1]	250	.2	330	.1
Duncannon silt loam, 3 to 10 percent slopes	100	[1]			100	[1]
Duncannon silt loam, 10 to 20 percent slopes	360	.2			360	.1
Duncannon silt loam, 20 to 30 percent slopes	100	[1]			100	[1]
Duncannon silt loam, 30 to 40 percent slopes	100	[1]			100	[1]
Ginat silt loam	250	.1			250	.1
Hackers loam, 0 to 3 percent slopes	10	[1]	130	.1	140	[1]
Hackers loam, 3 to 10 percent slopes	30	[1]	200	.1	230	.1
Hackers loam, 10 to 20 percent slopes	30	[1]	110	.1	140	[1]
Hackers silt loam, 0 to 3 percent slopes	320	.1	370	.2	690	.2
Hackers silt loam, 3 to 10 percent slopes	720	.3	620	.4	1,340	.3
Hackers silt loam, 10 to 20 percent slopes	50	[1]	90	[1]	140	[1]
Hackers silt loam, 20 to 30 percent slopes	10	[1]	100	.1	110	[1]
Huntington fine sandy loam	420	.2			420	.1
Huntington silt loam, 0 to 3 percent slopes	840	.4			840	.2
Huntington silt loam, 3 to 10 percent slopes	300	.1			300	.1
Huntington silt loam, low bottom	310	.1			310	.1
Lakin loamy sand, 3 to 10 percent slopes	280	.1			280	.1
Lakin loamy fine sand, 3 to 10 percent slopes	50	[1]			50	[1]
Lakin loamy fine sand, 10 to 20 percent slopes	340	.1			340	.1
Lakin loamy fine sand, 20 to 30 percent slopes	110	[1]			110	[1]
Lindside silt loam	1,050	.4			1,050	.2
Made land	20,100	8.5	4,240	2.8	24,340	6.3
Markland silt loam, 3 to 10 percent slopes	1,820	.8	270	.2	2,090	.5
Markland silt loam, 10 to 20 percent slopes	540	.2	60	[1]	600	.2
Markland silt loam, 30 to 40 percent slopes	210	.1	30	[1]	240	.1
Markland silty clay loam, 10 to 20 percent slopes, severely eroded	470	.2	40	[1]	510	.1
Markland silty clay loam, 20 to 30 percent slopes, severely eroded	480	.2	40	[1]	520	.1
Markland silty clay loam, 30 to 40 percent slopes, severely eroded	240	.1	50	[1]	290	.1
McGary silty clay loam	1,630	.7	550	.4	2,180	.6
Melvin silt loam	1,380	.6	660	.4	2,040	.5
Monongahela and Tilsit silt loams, 0 to 3 percent slopes	110	[1]	10	[1]	120	[1]
Monongahela and Tilsit silt loams, 3 to 10 percent slopes	5,940	2.5	1,690	1.1	7,630	2.0
Monongahela and Tilsit silt loams, 10 to 20 percent slopes	8,120	3.4	4,400	2.9	12,520	3.3
Monongahela and Tilsit silt loams, 10 to 20 percent slopes, severely eroded	2,770	1.2	1,000	.7	3,770	1.0
Monongahela and Tilsit silt loams, 20 to 30 percent slopes	50	[1]	130	.1	180	[1]
Monongahela and Tilsit silt loams, 20 to 30 percent slopes, severely eroded	100	[1]	180	.1	280	.1
Moshannon silt loam, 0 to 3 percent slopes	1,610	.7	550	.4	2,160	.6
Moshannon silt loam, 3 to 10 percent slopes	1,500	.6	1,130	.7	2,630	.7
Moshannon silt loam, low bottom	3,350	1.4	1,580	1.1	4,930	1.3
Moshannon silt loam, coarse subsoil variant	1,980	.8	2,210	1.5	4,190	1.1
Muskingum silt loam, 10 to 20 percent slopes	190	.2	390	.3	580	.2
Muskingum silt loam, 10 to 20 percent slopes, severely eroded	130	.1	190	.1	320	.1
Muskingum silt loam, 20 to 30 percent slopes	750	.3	1,100	.7	1,850	.5
Muskingum silt loam, 20 to 30 percent slopes, severely eroded	500	.2	750	.5	1,250	.3
Muskingum silt loam, 30 to 40 percent slopes	860	.4	750	.5	1,610	.4
Muskingum silt loam, 30 to 55 percent slopes, severely eroded	380	.2	670	.4	1,050	.2
Muskingum silt loam, 40 to 55 percent slopes	940	.4	1,400	.9	2,340	.6
Sciotoville silt loam, 0 to 3 percent slopes	280	.1			280	.1
Sciotoville silt loam, 3 to 10 percent slopes	360	.2			360	.1
Senecaville silt loam	7,490	3.2	2,550	1.7	10,040	2.6
Senecaville silt loam, low bottom	690	.3	60	[1]	750	.2
Steep land, alluvial materials	580	.2	480	.3	1,060	.2
Tygart silt loam	550	.2	400	.3	950	.2
Upshur silty clay loam, 3 to 10 percent slopes	80	[1]	20	[1]	100	[1]
Upshur silty clay loam, 10 to 20 percent slopes	420	.2	340	.2	760	.2
Upshur silty clay loam, 20 to 30 percent slopes	100	[1]	80	[1]	180	[1]
Upshur silty clay, 10 to 20 percent slopes, severely eroded	1,240	.5	460	.3	1,700	.4
Upshur silty clay, 20 to 30 percent slopes, severely eroded	820	.3	610	.4	1,430	.4
Upshur-Brooke silty clay loams, 10 to 20 percent slopes	1,340	.6	190	.1	1,530	.4
Upshur-Brooke silty clay loams, 20 to 30 percent slopes	330	.1	50	[1]	380	.1
Upshur-Brooke silty clays, 10 to 20 percent slopes, severely eroded	2,750	1.2	280	.2	3,030	.8

See footnote at end of table.

TABLE 8.—*Approximate acreage and proportionate extent of the soils*—Continued

Mapping unit	Wood County		Wirt County		Total	
	Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Upshur-Brooke silty clays, 20 to 30 percent slopes, severely eroded	7,960	3.4	2,690	1.8	10,650	2.8
Upshur-Brooke silty clays, 20 to 30 percent slopes, very severely eroded	1,470	.6	230	.2	1,700	.4
Upshur-Muskingum complex, 3 to 10 percent slopes	200	.1	100	.1	300	.1
Upshur-Muskingum complex, 10 to 20 percent slopes	4,040	1.7	1,420	.9	5,460	1.4
Upshur-Muskingum complex, 10 to 20 percent slopes, severely eroded	5,960	2.5	1,260	.8	7,220	1.9
Upshur-Muskingum complex, 20 to 30 percent slopes	7,110	3.1	7,460	5.0	14,570	3.8
Upshur-Muskingum complex, 20 to 30 percent slopes, severely eroded	35,240	15.0	20,380	13.6	55,620	14.4
Upshur-Muskingum complex, 20 to 30 percent slopes, very severely eroded	8,590	3.6	4,190	2.8	12,780	3.3
Upshur-Muskingum complex, 30 to 40 percent slopes	7,290	3.1	6,730	4.5	14,020	3.6
Upshur-Muskingum complex, 30 to 40 percent slopes, severely eroded	21,090	9.0	18,450	12.3	39,540	10.3
Upshur-Muskingum complex, 30 to 55 percent slopes, very severely eroded	2,550	1.1	2,230	1.5	4,780	1.2
Upshur-Muskingum complex, 40 to 55 percent slopes	11,500	4.9	16,590	11.1	28,090	7.3
Upshur-Muskingum complex, 40 to 55 percent slopes, severely eroded	22,990	9.8	23,665	15.8	46,655	12.1
Upshur-Muskingum very stony complex, 30 to 55 percent slopes	330	.1	880	.6	1,210	.3
Vandalia silty clay loam, 3 to 10 percent slopes	230	.1	100	.1	330	.1
Vandalia silty clay loam, 10 to 20 percent slopes	2,110	.9	970	.6	3,080	.8
Vandalia silty clay loam, 10 to 20 percent slopes, severely eroded	950	.4	630	.4	1,580	.4
Vandalia silty clay loam, 20 to 30 percent slopes	1,280	.5	1,200	.8	2,480	.6
Vandalia silty clay loam, 20 to 30 percent slopes, severely eroded	6,420	2.7	3,680	2.4	10,100	2.6
Vandalia silty clay loam, 30 to 40 percent slopes	320	.1	180	.1	500	.1
Vandalia silty clay loam, 30 to 40 percent slopes, severely eroded	690	.3	1,010	.7	1,700	.4
Vandalia very stony silty clay loam, 20 to 30 percent slopes	80	(1)	390	.3	470	.1
Vandalia very stony silty clay loam, 30 to 40 percent slopes	60	(1)	230	.2	290	.1
Vandalia silty clay, 20 to 30 percent slopes, very severely eroded	2,320	1.0	1,600	1.1	3,920	1.0
Wheeling fine sandy loam, 0 to 3 percent slopes	140	.1	----------	--------	140	(1)
Wheeling fine sandy loam, 3 to 10 percent slopes	90	(1)	----------	--------	90	(1)
Wheeling fine sandy loam, 10 to 20 percent slopes	80	(1)	----------	--------	80	(1)
Wheeling silt loam, 0 to 3 percent slopes	330	.1	----------	--------	330	.1
Wheeling silt loam, 3 to 10 percent slopes	290	.1	----------	--------	290	.1
Wheeling silt loam, 10 to 20 percent slopes	80	(1)	----------	--------	80	(1)
Zoar silt loam, 3 to 10 percent slopes	470	.2	150	.1	620	.2
Zoar silt loam, 10 to 20 percent slopes	620	.3	90	(1)	710	.2
Zoar silty clay loam, 10 to 20 percent slopes, severely eroded	1,580	.7	65	(1)	1,645	.4
Zoar silty clay loam, 20 to 30 percent slopes, severely eroded	90	(1)	10	(1)	100	(1)
Total	235,520	100.0	149,760	100.0	385,280	100.0

[1] Less than 0.05 percent.

loam in the lower part. The underlying material is dark-red, firm sandy clay loam that contains lenses of silt, sand, and clay.

Allen soils are moderately permeable and low in natural fertility. The hazard of erosion is moderate to severe.

These soils are used for pasture and hay and for most cultivated crops commonly grown in the two counties. They are good homesites, and homes have been built in some areas in the vicinity of Pettyville.

Typical profile of Allen loam, 3 to 10 percent slopes, in Wood County, in a wooded area near Pettyville along U.S. Highway No. 21:

Ap—0 to 6 inches, dark-brown (7.5YR 4/4) loam; weak, fine, granular structure; friable; many roots; very strongly acid; gradual, wavy boundary; horizon 5 to 8 inches thick.

A2—6 to 11 inches, dark yellowish-brown (10YR 4/4) loam; weak, fine, subangular blocky structure, tending towards thin platy structure; friable; many roots; very strongly acid; gradual, wavy boundary; horizon 4 to 7 inches thick.

B1—11 to 17 inches, yellowish-red (5YR 4/8) loam; weak, fine, subangular blocky structure; friable; few roots; very strongly acid; clear, wavy boundary; horizon 5 to 7 inches thick.

B21t—17 to 27 inches, yellowish-red (5YR 4/6) clay loam; moderate, fine and medium, subangular blocky structure; firm; few roots; few clay coatings on ped faces; very strongly acid; gradual, wavy boundary; horizon 8 to 12 inches thick.

B22t—27 to 37 inches, yellowish-red (5YR 4/6) clay loam; moderate, fine and medium, subangular blocky structure; firm; few roots; few clay coatings on ped faces; prominent, medium to coarse coatings of manganese; very strongly acid; gradual, wavy boundary; horizon 7 to 12 inches thick.

B3—37 to 48 inches, yellowish-red (5YR 4/8) clay loam; massive, tending towards thick platy structure; firm; prominent, medium to coarse coatings of manganese; very strongly acid; clear, wavy boundary; horizon 10 to 12 inches thick.

C—48 to 60 inches, dark-red (2.5YR 3/6) sandy clay loam that has lenses of silt, sand, and clay; massive; firm; very strongly acid.

The B2t horizon is generally clay loam, but it is sandy clay loam or silty clay loam in some places. The hue throughout the B horizon normally is 5YR, but it is 7.5YR or 2.5YR in some areas. Where a hue of 7.5YR occurs, it generally is in the upper part of the B horizon.

The Allen soils occur with the moderately well drained Monongahela soils. Allen soils lack the fragipan that occurs in the Monongahela soils and have better internal drainage and a redder subsoil.

Allen loam, 3 to 10 percent slopes (AeB).—This soil commonly occurs on the crest of terraces throughout the two counties. It has the profile described as typical for the series. The hazard of erosion is moderate in unprotected areas.

Included with this soil in mapping were a few acres of a severely eroded Allen soil.

Allen loam, 3 to 10 percent slopes, is suited to most crops commonly grown in the two counties. (Capability unit IIe-4)

Allen loam, 10 to 20 percent slopes (AeC).—This soil has a profile similar to that described as typical for the series, except that depth to the underlying material is slightly less. The hazard of erosion is severe in unprotected areas.

This soil is suited to most of the crops grown locally. (Capability unit IIIe-4)

Allen loam, 10 to 20 percent slopes, severely eroded (AeC3).—This soil has lost most of its original surface layer through erosion. Its present surface layer is in poorer tilth and contains less organic matter than the surface layer of Allen loam, 3 to 10 percent slopes.

Although a row crop can be grown occasionally, this soil is better suited to hay or pasture. (Capability unit IVe-3)

Allen loam, 20 to 30 percent slopes, severely eroded (AeD3).—This soil occurs mainly along breaks between the terraces and the low bottom lands and on slopes above the drainageways. Its profile is somewhat coarser textured and is more shallow to the underlying material than that described as typical for the series. Most of the original surface layer has been lost through erosion, and the present surface layer contains less organic matter and is in poorer tilth than the surface layer of uneroded Allen soils.

Included with this soil in mapping were a few acres that are moderately eroded.

Because of the slope and the severe erosion, this soil should be used for hay and pasture. (Capability unit VIe-2)

Ashton Series

The Ashton series consists of deep, well-drained soils that occur on high bottom lands. These soils developed in alluvium washed from soils of the upland that have been affected by lime. They occupy low ridgelike areas that parallel the Ohio River in Wood County. Slopes range from 0 to 10 percent, but slopes of 0 to 5 percent are dominant.

In a typical profile the plow layer is dark-brown silt loam about 10 inches thick. The subsoil extends to a depth of 42 inches and consists of dark-brown silt loam. The underlying material is dark-brown to dark yellowish-brown sandy clay loam or fine sandy loam that is mottled with gray and strong brown.

Ashton soils are easy to work. They can hold enough moisture for good growth of plants. Natural fertility is high, and permeability is moderate.

These soils are suited to the crops commonly grown in the two counties. They are flooded only when floodwaters are at their highest.

Typical profile of Ashton silt loam, 0 to 3 percent slopes, in Wood County, in a hayfield one-half mile north of Belleville and about 350 yards east of the Ohio River:

Ap—0 to 10 inches, dark-brown (10YR 3/3) silt loam; moderate, medium, granular structure; very friable when moist; slightly hard when dry; many roots; slightly acid; abrupt, smooth boundary; horizon 8 to 12 inches thick.

B1—10 to 18 inches, dark-brown (10YR 4/3) silt loam; dark brown (10YR 3/3) on ped faces; weak, coarse, granular structure and weak, fine, subangular blocky structure; friable when moist, slightly hard when dry; fine roots common; slightly acid; clear, wavy boundary; horizon 6 to 10 inches thick.

B2t—18 to 33 inches, dark-brown (7.5YR 4/4) heavy silt loam; dark-brown (7.5YR 4/2) clay coatings on ped faces; moderate, medium, subangular blocky structure in which peds are arranged in weak, medium, and coarse prisms; friable when moist, slightly hard when dry; fine roots common; medium acid; clear, wavy boundary; horizon 12 to 20 inches thick.

B3—33 to 42 inches, dark-brown (7.5YR 4/4) light silt loam; dark-brown (7.5YR 4/2) clay coatings on ped faces; weak, medium, subangular blocky structure; friable; few fine roots; medium acid; gradual, wavy boundary; horizon 6 to 10 inches thick.

C—42 to 60 inches +, dark-brown (7.5YR 4/4) to dark yellowish-brown (10YR 4/4) sandy clay loam or heavy fine sandy loam; few mottles of gray and strong brown; massive; very friable; sand increases with depth; medium acid.

The B horizon is generally heavy silt loam, but ranges from silt loam to silty clay loam.

Its color is dark brown or dark yellowish brown in hues of 7.5YR and 10YR.

The Ashton soils occur with the well drained Huntington soils, the moderately well drained to somewhat poorly drained Lindside soils, and the poorly drained Melvin soils. Ashton soils are flooded less frequently than Huntington soils and show stronger profile development.

Ashton silt loam, 0 to 3 percent slopes (AsA).—This soil is most common in the vicinity of Belleville. It has the profile described as typical for the series. Row crops can be grown every year if management is good. (Capability unit I-6)

Ashton silt loam, 3 to 10 percent slopes (AsB).—This soil commonly occurs in narrow, low, ridgelike areas that parallel the Ohio River. The hazard of erosion is moderate.

Included with this soil in mapping were a few acres of strongly sloping soils that occur as narrow bands between the different levels of the bottom lands.

This soil is used for cultivated crops, hay, and pasture. Because of runoff and the hazard of erosion, it is not used so intensively as Ashton silt loam, 0 to 3 percent slopes. (Capability unit IIe-6)

Brooke Series

The Brooke series consists of moderately deep, well-drained soils of the uplands. These soils developed on calcareous gray shale and limestone. They occur in small areas on ridgetops and benches, mainly in the vicinity of Rockport, Wadeville, Dallison, and Deerwalk in Wood County and near Windy, Garfield, and Morristown in Wirt County. Slopes range from 10 to 30 percent, but slopes of 20 to 30 percent are dominant.

In a typical profile the plow layer is very dark grayish-brown silty clay about 8 inches thick. The subsoil extends to a depth of about 22 inches and consists of yellowish-brown silty clay in the upper part and of olive clay in the lower part. The underlying material is olive-gray silty clay and fragments of calcareous gray shale and limestone.

These fragments make up about 50 percent of this layer, by volume. Bedrock is at a depth of about 30 inches.

Brooke soils are difficult to work, and they puddle if worked when wet. Shrink-swell potential is high. Permeability is moderately slow.

These soils are poorly suited to cultivated crops, but they are well suited to hay and pasture plants if management is good.

In Wood and Wirt Counties, Brooke soils occur in an intricate pattern with Upshur soils and were mapped with them only in complexes.

Typical profile of a severely eroded Brooke silty clay having a slope of 20 to 30 percent, in Wood County, on a roadbank along the Lee Creek road 2 miles from Rockport:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silty clay; moderate to strong, very fine, subangular blocky structure; slightly sticky; neutral; clear, wavy boundary; horizon 5 to 8 inches thick.

B1—8 to 12 inches, yellowish-brown (10YR 5/4) silty clay; strong, fine, subangular blocky structure; sticky; neutral to mildly alkaline; abrupt, irregular boundary; horizon 0 to 5 inches thick.

B2t—12 to 22 inches, olive (5Y 5/3) clay; strong, fine, subangular blocky structure; friable to firm; clay coatings on ped faces; neutral to mildly alkaline; abrupt, irregular boundary; horizon 5 to 10 inches thick.

C—22 to 30 inches, olive-gray (5Y 5/2) silty clay; weak, fine and medium, subangular blocky structure, 50 percent of horizon is fine blocky and angular fragments of siltstone or sandstone that break under moderate pressure; neutral to mildly alkaline; gradual, irregular boundary; horizon 8 to 12 inches thick.

R—30 inches +, olive-gray (5Y 5/2) weathered gray shale and limestone; neutral or calcareous.

The texture of the A horizon is silty clay or silty clay loam. The B horizon is olive gray and olive brown in some places. The olive colors generally occur where the pH value is the highest. Reaction ranges from slightly acid to mildly alkaline in the B horizon.

The Brooke soils are not so waxy and red as the well-drained Upshur soils and are more limy.

Cotaco Series

The Cotaco series consists of deep, moderately well drained soils on stream terraces. These soils developed in alluvium washed mainly from soils of the upland that were underlain by sandstone and shale. Most areas of these soils are along the Little Kanawha River in the two counties. Slopes range from 0 to 20 percent.

In a typical profile the surface layer is silt loam about 9 inches thick. It is dark grayish brown in the upper 6 inches and brown in the lower 3 inches. The subsoil extends to a depth of 42 inches. It is yellowish-brown and reddish-brown silty clay loam to a depth of 28 inches and is dark-brown clay loam below. Distinct mottles of yellowish brown and light brownish gray occur between depths of 16 and 28 inches. The underlying material is dark-brown loam.

Cotaco soils have moderately slow permeability.

These soils are suited to cultivated crops, hay, and pasture. A seasonal high water table prevents deep-rooted legumes from lasting long.

Typical profile of Cotaco silt loam, 0 to 3 percent slopes, in Wirt County, along lane in a hayfield on Roberts Hereford Farm on the Little Kanawha River:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable; medium acid; abrupt, smooth boundary; horizon 4 to 8 inches thick.

A2—6 to 9 inches, brown (10YR 5/3) silt loam; weak to moderate, very fine, subangular blocky structure, tending towards medium platy structure; friable; strongly acid; clear, wavy boundary; horizon 0 to 5 inches thick.

B1—9 to 16 inches, yellowish-brown (10YR 5/4) light silty clay loam; moderate, fine and medium, subangular blocky structure; very strongly acid; gradual boundary; horizon 5 to 10 inches thick.

B21t—16 to 28 inches, reddish-brown (5YR 5/4) light silty clay loam; few, small, distinct mottles of yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2); moderate, medium and coarse, subangular blocky structure in which peds are arranged in weak coarse prisms; very firm; few discontinuous clay flows; few coatings of manganese; few pebbles; very strongly acid; gradual, wavy boundary; horizon 9 to 15 inches thick.

B22t—28 to 42 inches, dark-brown (7.5YR 4/4) clay loam; faintly mottled, reddish-brown (5YR 5/3) ped coatings; few gray (N 6/0) coats and streaks of clay; few pebbles; strongly acid; diffuse, wavy boundary; horizon 12 to 18 inches thick.

C—42 to 60 inches +, dark-brown (7.5YR 4/4) loam; massive; firm; a few pebbles; strongly acid.

The solum ranges from 32 to 44 inches in thickness.

The Cotaco soils are associated with the Allen, Monongahela, and Hackers soils. Profile development is weaker in the Cotaco soils than in the Allen or Monongahela soils but is stronger than in the Hackers. The Cotaco soils are not so well drained as the Allen or Hackers soils. Cotaco soils lack the fragipan that is characteristic of the Monongahela soils.

Cotaco silt loam, 0 to 3 percent slopes (CoA).—This soil has a high water table in winter and early in spring. It has the profile described as typical for the series.

Included with this soil in mapping were soils that have small wet pockets.

This soil is suited to row crops if management is good. (Capability unit IIw-1)

Cotaco silt loam, 3 to 10 percent slopes (CoB).—This soil is moderately susceptible to erosion in unprotected areas. Its profile is slightly shallower to underlying material than that described as typical for the series.

This soil is suited to row crops, but use for these crops is limited by the erosion hazard. (Capability unit IIe-13)

Cotaco silt loam, 10 to 20 percent slopes (CoC).—This soil occurs along the narrow breaks and in local dissected areas. In most places its profile is slightly coarser textured than that described as typical for the series, and its combined surface layer and subsoil are thinner. The hazard of erosion is severe in unprotected areas.

Included with this soil in mapping were a few acres in which slopes are of more than 20 percent.

Because of the slope and the hazard of erosion, this soil is more difficult to manage than the less sloping Cotaco soils. (Capability unit IIIe-13)

Duncannon Series

The Duncannon series consists of deep, well-drained soils that developed in deep silt and very fine sand that apparently were deposited by the wind. These soils occur in Wood County, mainly on the hills facing the Ohio River, on the ridgetops nearby, and in dunelike areas, along the eastern edge of terraces occupied by the Wheeling soils. Slopes range from 3 to 40 percent, but slopes of 10 to 20 percent are dominant.

In a typical profile silt loam extends from the surface to a depth of 44 inches or more. The surface layer is about 10 inches thick and is grayish brown to brown in the uppermost 6 inches and pale brown below. The subsoil extends to a depth of about 32 inches and is yellowish brown in the upper and lower parts and strong brown in the middle part. The underlying material is yellowish brown mottled with strong brown.

Duncannon soils are moderately permeable and have moderate natural fertility. Where slopes are favorable, these soils are easy to work.

Duncannon soils are used mainly for hay and pasture. They are good homesites, and homes have been built in some areas.

Typical profile of Duncannon silt loam, 10 to 20 percent slopes, in Wood County, about 550 yards east of Jackson Junior High, Jackson Park, in Vienna:

Ap—0 to 6 inches, grayish-brown to brown (10YR 5/2–5/3) silty loam; weak, fine, granular structure; very friable when moist, soft when dry; many roots; very strongly acid; abrupt, smooth boundary; horizon 5 to 9 inches thick.

A2—6 to 10 inches, pale-brown (10YR 6/3) silt loam; weak, thin, platy structure; very friable when moist, soft when dry; roots common; very strongly acid; clear, wavy boundary; horizon 4 to 7 inches thick.

B1—10 to 15 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine and medium, subangular blocky structure; friable when moist, slightly hard when dry; roots common; some material from the A2 horizon occurs as coatings and small pockets; very strongly acid; clear, wavy boundary; horizon 2 to 6 inches thick.

B21t—15 to 25 inches, strong-brown (7.5YR 5/6) silt loam, somewhat heavier than in the Ap, A2, and B1 horizons; weak to moderate, medium, subangular blocky structure; friable; few roots; few clay coatings of reddish brown in pores and on some ped faces; very strongly acid; clear, wavy boundary; horizon 8 to 12 inches thick.

B22t—25 to 32 inches, yellowish-brown (10YR 5/4–5/6) silt loam; weak, medium, subangular blocky structure; friable to firm; few roots; few coatings of brown (7.5YR 5/4) and light yellowish brown (10YR 6/4); manganese coatings common; very strongly acid; gradual, wavy boundary; horizon 6 to 10 inches thick.

C—32 to 44 inches +, yellowish-brown (10YR 5/6) silt loam; very few to few, distinct mottles of strong brown (7.5YR 5/6); massive, breaking to weak, coarse, subangular blocky structure; friable to firm; few roots; few silt or fine sand coatings of pale brown (10YR 6/3); manganese coatings common; very strongly acid.

The texture of the B horizon ranges from light silty clay loam to loam but is silt loam in most places. This horizon ranges from strongly acid to very strongly acid. The total thickness of deposited material ranges from 30 inches to 15 feet. On hillsides this material was deposited over the Upshur and Muskingum soils.

The Duncannon soils occur with the excessively drained Lakin soils but are finer textured throughout. Duncannon soils show stronger profile development than Lakin soils and have horizons of clay accumulation.

Duncannon silt loam, 3 to 10 percent slopes (DuB).—On this soil the hazard of erosion is moderate in unprotected areas. In most places the profile of this soil is deeper to underlying material than that described as typical for the series.

Included with this soil in mapping were a few acres of nearly level soils.

Because of the slope, this soil is easier to work than the steeper Duncannon soils. It is suited to crops, hay, and pasture. (Capability unit IIe–4)

Duncannon silt loam, 10 to 20 percent slopes (DuC).—This soil occurs mainly on benches of hillsides facing the Ohio River and on the ridgetops nearby. It has the profile described as typical for the series. The hazard of erosion is severe in unprotected areas.

Included with this soil in mapping were a few acres of severely eroded soils. Also included were a few small areas of Lakin soils.

This soil is suited to crops, hay, and pasture. (Capability unit IIIe–4)

Duncannon silt loam, 20 to 30 percent slopes (DuD).—This soil generally occurs in hummocky and irregularly shaped areas. Because of steepness, runoff is rapid and erosion is a severe hazard in unprotected areas.

This soil is well suited to pasture and hay. If management is good, a row crop can be grown occasionally. (Capability unit IVe–3)

Duncannon silt loam, 30 to 40 percent slopes (DuE).—This steep soil is mainly on the hillsides facing the Ohio River. It developed in material deposited over the Upshur and Muskingum soils. Its profile is generally shallower to underlying material than that described as typical for the series. The hazard of erosion is very severe in unprotected areas.

Included with this soil in mapping were some areas having slopes of more than 40 percent. Also included were small areas of Upshur-Muskingum complex, 30 to 40 percent slopes, and small areas of Lakin soils.

Most of this Duncannon soil is wooded or lies idle. Because of the slope and the severe hazard of erosion, use of this soil for pasture is limited. (Capability unit VIIe–2)

Ginat Series

The Ginat series consists of deep, poorly drained soils on terraces along the Ohio River in Wood County. These soils developed in glacial outwash material, have a fragipan in the subsoil, and are underlain by sand or sand and gravel. They occur on flats and in depressions parallel to the Ohio River and are generally surrounded by areas of Wheeling soils. Slopes range from 0 to 6 percent, but slopes of 0 to 3 percent are dominant.

In a typical profile the surface layer is 11 inches thick and is friable, very dark grayish-brown silt loam in the upper part and friable, grayish-brown loam in the lower part. The subsoil extends to a depth of about 52 inches. It is friable, dark grayish-brown clay loam above the fragipan. The fragipan is firm grayish-brown clay loam in the upper part and is firm, gray sandy clay loam in the lower part. The underlying material is grayish-brown loamy fine sand. Mottles of strong brown occur throughout the profile.

Ginat soils have poor surface drainage, a slowly permeable subsoil, and a high water table. They remain wet until late in spring.

Because Ginat soils are wet, deep-rooted legumes do not last long. Limitations to use for buildings sites are severe.

Typical profile of Ginat silt loam, in Wood County, in a pasture about 450 feet east of U.S. Route 21 and three-fourths mile north of Kellar Lane in Boaz:

Ap—0 to 5 inches, very dark grayish-brown (10YR 3/2) silt loam; few, medium, distinct mottles of strong brown (7.5YR 5/6); weak, coarse, granular structure; friable; many roots; strongly acid; abrupt, wavy boundary; horizon 3 to 6 inches thick.

A2—5 to 11 inches, grayish-brown (2.5Y 5/2) loam; common, medium, distinct mottles of strong brown (7.5YR 5/6); weak, fine, granular structure; friable; many roots; material from Ap horizon fills root holes; strongly acid; clear, wavy boundary; horizon 4 to 8 inches thick.

B2tg—11 to 25 inches, dark grayish-brown (10YR 4/2) clay loam; common, medium, distinct mottles of strong brown (7.5YR 5/6); medium subangular structure; friable; few roots, mainly between cleavage planes; very dark gray (2.5Y 3/0) coatings; discontinuous clay coatings on ped faces; very strongly acid; clear, wavy boundary; horizon 12 to 18 inches thick.

Bx1g—25 to 32 inches, grayish-brown (2.5Y 5/2) light clay loam; many, medium and coarse, distinct mottles and streaks of strong brown (7.5YR 5/6); weak, coarse, prismatic structure; firm; very dark gray (N 3/0) coatings on prism faces; sandy lumps of strong-brown (7.5YR 5/6) material; a few gray (10YR 5/1) clay flows; very strongly acid; gradual, wavy boundary; horizon 5 to 10 inches thick.

Bx2g—32 to 52 inches, gray (N 5/0) sandy clay loam; common, medium and coarse, distinct mottles of strong brown (7.5YR 5/6); moderate, coarse, prismatic structure; firm; very dark gray (2.5Y 3/0) coatings on prism faces; sandy lumps of strong-brown (7.5YR 5/6) material; very strongly acid; gradual, wavy boundary; horizon 15 to 28 inches thick.

IIC—52 to 60 inches, grayish-brown (2.5Y 5/2) loamy fine sand; common, medium and coarse mottles of strong brown (7.5YR 5/6); massive; friable; strongly acid.

The B horizon ranges from silty clay loam to silt loam in texture and from strongly acid to very strongly acid in reaction. Depth to silt and fine sand ranges from 3 to 6 feet.

The Ginat soils occur with the well drained Wheeling soils and the moderately well drained Sciotoville soils. Ginat soils are generally deeper to gravel than are Wheeling soils.

Ginat silt loam (Gn).—This poorly drained, wet soil can be improved by artificial drainage, but suitable outlets are lacking in some places. Some areas receive runoff from adjacent hills. If drained, this soil is suited to moisture-tolerant crops. Slopes range from 0 to 6 percent, but slopes of 0 to 3 percent are dominant.

Included with this soil in mapping were small sandy areas and small areas in which the soil is redder than this one. (Capability unit IIIw–1)

Hackers Series

The Hackers series consists of deep, well-drained soils that occur on high bottom lands. These soils developed in alluvium that washed from upland areas of soils formed in calcareous, red clay shale and acid sandstone and shale. Hackers soils occur mainly along the Little Kanawha and Hughes Rivers, but a small acreage is along smaller streams in both counties. Slopes range from 0 to 30 percent, but slopes of 0 to 6 percent are dominant.

In a typical profile the plow layer is dark-brown silt loam about 6 inches thick. The subsoil extends to a depth of 35 inches and consists of dark-brown to reddish-brown silt loam in the upper part and of reddish-brown silty clay loam in the lower part. The underlying material is reddish-brown sandy clay loam to a depth of more than 48 inches. The content of sand and silt increases with depth.

Hackers soils are easy to work. Permeability is moderate, and natural fertility is high.

These soils are suited to the crops commonly grown in the two counties. They are flooded only when floodwaters are at their highest.

Typical profile of Hackers silt loam, 0 to 3 percent slopes, in Wirt County, in a hayfield along the Hughes River about 1 mile east of the intersection of the Newark road and State Route 47:

Ap—0 to 6 inches, dark-brown (7.5YR 4/2) silt loam, moderate, fine, granular structure; firm; many fine roots; slightly acid; clear, smooth boundary; horizon 5 to 8 inches thick.

B1—6 to 14 inches, dark-brown (7.5YR 3/2) to reddish-brown (5YR 4/3) silt loam; moderate, medium and coarse, subangular blocky structure in which peds are arranged in weak medium prisms; firm; common roots; medium acid; gradual, wavy boundary; horizon 6 to 10 inches thick.

B2t—14 to 35 inches, reddish-brown (5YR 4/4) silty clay loam; moderate, medium and coarse, subangular blocky structure in which peds are arranged in weak medium prisms; firm; few clay coatings on ped faces and in pores; few roots; medium acid; gradual, wavy boundary; horizon 12 to 30 inches thick.

C—35 to 48 inches, reddish-brown (5YR 4/3–4/4) heavy sandy clay loam; massive, breaking to coarse, subangular blocks; firm; few roots; medium acid; content of sand and silt increases with depth.

The texture of the A horizon is loam in some places. The B2t horizon is generally silty clay loam but includes silt loam in some places.

The Hackers soils are near the well drained Moshannon soils, the moderately well drained to somewhat poorly drained Senecaville soils, and the poorly drained Melvin soils. Hackers soils are flooded less frequently than Moshannon soils and show stronger profile development.

Hackers loam, 0 to 3 percent slopes (HaA).—This nearly level soil occupies the higher areas above streams. It is also slightly more droughty and occurs in higher areas than Hackers silt loam, 0 to 3 percent slopes. Row crops can be grown every year. (Capability unit I–4)

Hackers loam, 3 to 10 percent slopes (HaB).—This soil occurs mainly in small areas along the stream edges of terraces. It is slightly more droughty than Hackers silt loam, 0 to 3 percent slopes. Erosion is a moderate hazard in unprotected areas.

The hazard of erosion limits the use of this soil for row crops. (Capability unit IIe–4)

Hackers loam, 10 to 20 percent slopes (HaC).—This soil occupies narrow breaks between terraces and bottom lands. The hazard of erosion is severe in unprotected areas.

Included with this soil in mapping were some small areas that have slopes of more than 20 percent.

This soil is limited in its use for row crops because of the severe hazard of erosion. (Capability unit IIIe–4)

Hackers silt loam, 0 to 3 percent slopes (HcA).—This soil has the profile described as typical for the series. It can be row cropped every year if management is good. (Capability unit I–6)

Hackers silt loam, 3 to 10 percent slopes (HcB).—This soil commonly occurs on bottom lands along the edges of streams and in areas dissected by shallow drainageways. The hazard of erosion is moderate.

Because of the hazard of erosion, use of this soil for row crops is limited. (Capability unit IIe–6)

Hackers silt loam, 10 to 20 percent slopes (HcC).—This soil generally occurs as narrow bands along breaks between different levels of bottom lands. Its profile is shallower to underlying material and, in some places, is coarser textured than the profile described as typical for the series. The hazard of erosion is severe in unprotected areas.

Areas of this soil are narrow and are managed in the same way as are the soils on adjacent slopes. The hazard of erosion limits the use of this soil for row crops. (Capability unit IIIe–6)

Hackers silt loam, 20 to 30 percent slopes (HcD).—This steep soil generally occurs as narrow bands along the banks of rivers and in local dissected areas. Its profile is shallower to underlying material and is slightly coarser textured than the profile described as typical for the series. The hazard of erosion is very severe in unprotected areas.

This soil is better suited to hay crops than to row crops. (Capability unit IVe–3)

Huntington Series

The Huntington series consists of deep, well-drained soils on bottom lands. These soils developed in alluvium washed from upland areas where the soils have been influenced by limestone. Huntington soils occur along the Ohio River in Wood County and are subject to flooding. Slopes range from 0 to 10 percent, but slopes of 0 to 5 percent are dominant.

In a typical profile the plow layer is very dark grayish-brown silt loam about 8 inches thick. The subsoil extends to a depth of 64 inches and consists of dark grayish-brown and dark-brown silt loam. The underlying material is dark-brown to reddish-brown sandy clay loam to clay loam that, at a depth of 74 inches, grades to reddish-brown, stratified fine sandy loam.

Huntington soils are easy to work. Natural fertility is high, and permeability is moderate. These soils generally are slightly acid but range from medium acid to neutral. Most areas are flooded about once in 5 or 6 years, but some low areas are flooded every year. Floods generally occur late in winter or early in spring.

These soils are well suited to crops, hay, and pasture.

Typical profile of Huntington silt loam, 0 to 3 percent slopes, in Wood County, in a hayfield one-quarter mile below Belleville on west side of gravel road, along the Ohio River:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; many fine roots; medium acid; abrupt boundary; horizon 6 to 9 inches thick.

B1—8 to 20 inches, dark grayish-brown (10YR 4/2) heavy silt loam; very dark grayish brown (10YR 3/2) on faces of peds; weak, medium, subangular blocky structure; friable; many fine roots; slightly acid; gradual boundary; horizon 10 to 15 inches thick.

B2—20 to 64 inches, dark-brown (10YR 4/3) heavy silt loam, dark brown (10YR 3/3) on faces of peds; weak, medium and coarse, subangular blocky structure; firm; neutral; horizon 26 to 44 inches thick.

C1—64 to 74 inches, dark-brown (7.5YR 4/4) to reddish-brown (5YR 4/4) sandy clay loam to clay loam; massive; medium acid; horizon 8 to 12 inches thick.

C2—74 to 80 inches, reddish-brown (5YR 4/4), stratified fine sandy loam; medium acid.

The Ap horizon is dominantly silt loam but ranges to fine sandy loam. The B horizon generally is silt loam or heavy silt loam.

The Huntington soils occur near the well drained Ashton soils, the moderately well drained to somewhat poorly drained Lindside soils, and the poorly drained Melvin soils. Huntington soils are flooded more frequently than the Ashton soils and have less profile development.

Huntington fine sandy loam (Hf).—This soil occupies areas near the Ohio River and is flooded occasionally. Slopes range from 0 to 5 percent. The profile of this soil is coarser textured than that described as typical for the series. This soil generally is lower in organic-matter content and is more droughty than Huntington silt loam, 0 to 3 percent slopes.

This soil is suited to the crops commonly grown in the two counties. Row crops can be grown every year if management is good. (Capability unit IIs–6)

Huntington silt loam, 0 to 3 percent slopes (HnA).—This soil is deep, nearly level, and subject to occasional flooding late in winter and early in spring before crops are planted. It has the profile described as typical for the series.

This soil is fertile and is easily worked. It is suited to the crops grown locally. A row crop can be grown every year if management is good. (Capability unit I–6)

Huntington silt loam, 3 to 10 percent slopes (HnB).—This soil is moderately susceptible to erosion. Its profile is similar to the one described as typical for the series.

Included with this soil in mapping were some small areas having slopes of more than 10 percent.

This soil is easily worked, but surface runoff and the hazard of erosion are limitations to use for row crops. (Capability unit IIe–6)

Huntington silt loam, low bottom (Ht).—This soil occurs mainly as narrow bands near the Ohio River. Slopes range from 0 to 3 percent. This soil is lower than most Huntington soils, and it is flooded more frequently than Huntington silt loam, 0 to 3 percent slopes. Most floods occur early in spring before crops are planted. Some areas are subject to scouring by floodwaters and others to deposition.

Included with this soil in mapping were some small areas where slopes are more than 3 percent. Also included were a few acres in which the surface layer is fine sandy loam.

This soil is suited to row crops. A cover crop helps to protect the soil in winter and spring. (Capability unit IIw–6)

Lakin Series

The Lakin series consists of deep, excessively drained soils that developed in deep, sandy material deposited by wind and water. These soils occur in Wood County on dunelike deposits, on water-laid material on low ridges that parallel the Ohio River, and on adjacent hillsides.

Slopes range from 3 to 30 percent, but slopes of 10 to 20 percent are dominant.

In a typical profile the surface layer is dark-brown loamy fine sand about 11 inches thick. It is underlain by strong-brown and yellowish-brown loamy fine sand that contains reddish-brown lumps and bands and extends to a depth of 80 inches. The underlying material is yellowish-brown loamy fine sand to fine sand.

Lakin soils are very rapidly permeable. They leach rapidly and are droughty.

These soils are used for crops, hay, and pasture. They are suitable as homesites and industrial sites, and in the vicinity of Parkersburg, are used for those purposes.

Typical profile of Lakin loamy fine sand, 10 to 20 percent slopes, in Wood County, west of U.S. Highway No. 21 along Northwood Terrace in Boaz:

Ap1—0 to 7 inches, dark-brown (10YR 4/3) loamy fine sand; weak, fine, granular structure; very friable; many roots; very strongly acid; clear, wavy boundary; horizon 5 to 8 inches thick.

Ap2—7 to 11 inches, dark-brown (10YR 4/3) loamy fine sand; pockets and lenses of strong brown (7.5YR 5/6); weak, fine, granular structure; very friable; somewhat compacted in places; many roots; very strongly acid; abrupt, wavy boundary; horizon 4 to 6 inches thick.

B&C1—11 to 25 inches, strong-brown (7.5YR 5/6) loamy fine sand; contains few small lumps of reddish-brown (5YR 4/3) material that are slightly higher in content of clay than the matrix; weak, fine, granular structure; very friable; common roots; very strongly acid; gradual, wavy boundary; horizon 10 to 11 inches thick.

B&C2—25 to 80 inches, yellowish-brown (10YR 5/4) loamy fine sand; single grain; very friable; contains reddish-brown (5YR 4/3) bands ¾ inch to 1½ inches wide that are about 8 inches apart and are higher in content of clay than the matrix; bands break to very weak, fine and medium, granular structure; few to very few roots; very strongly acid; diffuse, wavy boundary; horizon 44 to 56 inches thick.

C3—80 to 144 inches +, yellowish-brown (10YR 5/4) loamy fine sand to fine sand; single grain; very friable; contains discontinuous, thin, reddish-brown (5YR 4/3) bands of loamy fine sand about one-half inch wide that make up about 5 percent of horizon; very strongly acid.

The A horizon is loamy fine sand and loamy sand. The discontinuous bands or lumps in the B&C2 horizon are mainly loamy fine sand and are as thick as 1½ or 2 inches. Lakin loamy sand developed on water-laid deposits that are underlain by sand and gravel. Lakin loamy fine sand developed on sand that is more than 10 feet thick but ranges from 5 to 40 inches in thickness. Apparently this sand was deposited by wind.

The Lakin soils occur with the deep, well-drained Wheeling and Duncannon soils but are coarser textured and show less profile development than those soils.

Lakin loamy sand, 3 to 10 percent slopes (LaB).—This soil occurs mainly on low ridges that parallel the Ohio River. The soil is near the Wheeling soils. It is underlain by gravel at a depth of 4 to 6 feet. Its profile is coarser textured than that described as typical for the series.

Lakin loamy sand, 3 to 10 percent slopes, is suited to the crops commonly grown in the two counties. (Capability unit IIIs–1)

Lakin loamy fine sand, 3 to 10 percent slopes (LkB).—This soil is low in organic-matter content and leaches rapidly. It is droughty, but less so than Lakin loamy fine sand, 10 to 20 percent slopes.

Lakin loamy fine sand, 3 to 10 percent slopes, is suited to crops, hay, and pasture. Crops that mature late may be damaged in summer by lack of moisture. (Capability unit IIIs–1)

Lakin loamy fine sand, 10 to 20 percent slopes (LkC).—This soil occurs mainly in dunelike areas. It has the profile described as typical for the series. This soil is low in organic-matter content and leaches rapidly. It is susceptible to severe erosion in unprotected areas.

This soil is suited to crops, hay, and pasture, but use for row crops is limited by the hazard of erosion. (Capability unit IVs–1)

Lakin loamy fine sand, 20 to 30 percent slopes (LkD).—This soil commonly occurs in dunelike areas and on hillsides adjacent to the Wheeling soils. It is more shallow on hillsides than it is in the dunelike areas. This soil is more droughty than Lakin loamy fine sand, 10 to 20 percent slopes.

Because of steep slopes, hazard of erosion, and droughtiness, this soil is not suited to cultivated crops and has only limited use for hay and pasture. (Capability unit VIs–5)

Lindside Series

The Lindside series consists of deep, moderately well drained and somewhat poorly drained soils on flood plains of the Ohio River. These soils developed in sediments washed from upland areas where the soils have been influenced by limestone. They occur in nearly level areas and in slight depressions parallel to the Ohio River and are generally surrounded by areas of Ashton and Huntington soils. Slopes range from 0 to 10 percent, but slopes of 0 to 3 percent are dominant.

In a typical profile the plow layer is dark grayish-brown silt loam about 8 inches thick. The subsoil extends to a depth of about 30 inches and is distinctly mottled with yellowish red and light brownish gray between depths of 17 and 30 inches. The subsoil consists of dark-brown silt loam in the upper part and dark grayish-brown silty clay loam in the lower part. The underlying material is dark grayish-brown silt loam mottled with very pale brown and yellowish red.

Lindside soils are high in natural fertility and are easy to work. Areas near the Huntington soils are flooded about once in 4 to 6 years, but areas near the Ashton soils are flooded only when floodwaters are high.

These soils are suited to the crops commonly grown in the two counties and to hay and pasture. Wetness and the hazard of flooding limit suitability of these soils for deep-rooted legumes. Flooding and a high water table limit use for home sites and industrial sites.

Typical profile of Lindside silt loam, in Wood County, in a cornfield about 650 feet east of the Ohio River, 1.5 miles north of Kellar Lane in Boaz:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; few roots; strongly acid; clear boundary; horizon 6 to 10 inches thick.

B1—8 to 17 inches, dark-brown (10YR 4/3) fine silt loam; weak, fine, granular structure; friable; few roots; strongly acid; clear boundary; horizon 6 to 10 inches thick.

B2—17 to 30 inches, dark grayish-brown (10YR 4/2) silty clay loam; many, fine and medium, distinct mottles of yellowish red (5YR 4/6) and few mottles of light brownish gray (10YR 6/2); brown (10YR 5/3) inside of peds; weak, medium and coarse, subangular blocky structure; firm; few roots; medium acid; gradual boundary; horizon 12 to 16 inches thick.

C—30 to 42 inches +, dark grayish-brown (10YR 4/2) fine silt loam; common, medium, distinct mottles of very pale brown (10YR 7/3) and yellowish red (5YR 5/6); dark brown (10YR 4/3) inside of peds; massive; firm; medium acid.

The B horizon is mainly silt loam to light silty clay loam. Depth to mottling ranges from 15 to 30 inches.

Lindside soils occur with the well-drained Ashton and Huntington soils and the poorly drained Melvin soils.

Lindside silt loam (Ln).—This soil is suited to the crops commonly grown in the two counties including hay and pasture. If crops are grown, drainage is needed in some of the small, wet areas. Slopes range from 0 to 3 percent. (Capability unit IIw-7)

Made Land

Made land (Ma) consists of areas in which the soil material has been disturbed and changed by excavations, fills, gradings, or other earth-moving operations. Slopes range from nearly level to steep. The soil material is variable in texture, structure, and fertility. Because this land is so varied, examination is needed on the site to determine suitability for specific uses. Most areas are used for industrial, commercial, and residential sites. (Capability unit not assigned)

Markland Series

The Markland series consists of deep, moderately well drained soils on terraces. These soils developed in calcareous silt and clay deposited by slack water. They commonly occur near Pettyville and Mineralwells in Wood County and near Newark in Wirt County. Slopes range from 3 to 40 percent, but slopes of 3 to 10 percent are dominant.

In a typical profile the plow layer is dark grayish-brown silt loam about 9 inches thick. The subsoil is about 31 inches thick and is mottled with strong brown and light brownish gray between a depth of 14 to 40 inches. The subsoil is yellowish-brown, firm silty clay loam in the uppermost 10 inches, is dark yellowish-brown, firm silty clay in the middle part, and is dark-brown, very firm clay in the lower part. The underlying material is brown, very firm clay mottled with light brownish gray.

Markland soils are slowly permeable. They are saturated with water in winter and are slow to warm up in spring. These soils are cloddy if worked when wet.

These soils are better suited to hay and pasture than to cultivated crops. Deep-rooted legumes, however, do not last long. The moderately high water table and the slowly permeable subsoil restrict the use of these soils for septic tank filter fields.

Typical profile of Markland silt loam, 3 to 10 percent slopes, in Wood County, in a cornfield along State Route 47, three-fourths mile west of Kanawha:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; many fine roots; medium acid; abrupt, smooth boundary; horizon 5 to 9 inches thick.

B1—9 to 14 inches, yellowish-brown (10YR 5/6) silty clay loam; weak, fine and medium, subangular blocky structure; firm; many fine roots; strongly acid; clear, wavy boundary; horizon 3 to 5 inches thick.

B21t—14 to 19 inches, yellowish-brown (10YR 5/6) silty clay loam; light brownish gray (10YR 6/2) on surface of peds; few, fine, distinct mottles of strong brown (7.5YR 5/8); moderate, fine and medium, subangular blocky structure in which peds are arranged in prisms; firm; few fine roots; very strongly acid; clear, wavy boundary; horizon 5 to 8 inches thick.

B22t—19 to 25 inches, dark yellowish-brown (10YR 4/4) silty clay; light brownish gray (10YR 6/2) on surface of peds; common to many, fine to medium, distinct mottles of strong brown (7.5YR 5/8); moderate, medium, prismatic structure, breaking to moderate, medium, subangular blocky structure; firm; very few fine roots; strongly acid; gradual boundary; horizon 6 to 9 inches thick.

B3—25 to 40 inches, dark-brown (7.5YR 4/4) clay; many, medium, prominent mottles of light brownish gray (2.5Y 6/2); weak, medium and coarse, prismatic structure, breaking to coarse, subangular blocky structure; very firm; very few fine roots; medium acid; gradual boundary; horizon 6 to 15 inches thick.

C—40 to 60 inches, brown (10YR 5/3) clay; many, medium, distinct mottles of light brownish gray (2.5Y 6/2); massive, tending towards weak, coarse, prismatic structure; very firm; concretions of calcium carbonate common; neutral.

The texture of the Ap horizon is silty clay loam in some places. Depth to mottling ranges from 14 to 20 inches, and depth to the neutral soil material ranges from 2 to 5 feet.

The Markland soils occur with the somewhat poorly drained to poorly drained McGary soils, but they have better internal drainage than those soils.

Markland silt loam, 3 to 10 percent slopes (MdB).—On this soil, the hazard of erosion is moderate in unprotected areas. Mottling generally begins at a depth of 14 to 16 inches. This soil has the profile described as typical for the series.

Included with this soil in mapping were a few small, severely eroded areas and a few acres having slopes of less than 3 percent.

Markland silt loam, 3 to 10 percent slopes, is suited to cultivated crops, hay, and pasture. Drainage may be needed in some small areas. (Capability unit IIe-14)

Markland silt loam, 10 to 20 percent slopes (MdC).—This soil occurs mainly on outer edges of terraces and in areas above shallow drainageways. Mottling generally begins at a depth of 18 to 20 inches. Runoff is rapid, and the hazard of erosion is severe in unprotected areas.

The slope, rapid runoff, and the hazard of erosion restrict the use of this soil for row crops. (Capability unit IIIe-14)

Markland silt loam, 30 to 40 percent slopes (MdE).—This soil occurs on steep breaks, mainly as narrow bands around areas of less sloping Markland and McGary soils. Runoff is very rapid, and the hazard of erosion is very severe in unprotected areas.

Included with this soil in mapping were a few areas that have slopes of more than 40 percent.

Because of the steepness and the hazard of erosion, this soil is better suited to pasture and trees than to other uses. (Capability unit VIe-1)

Markland silty clay loam, 10 to 20 percent slopes, severely eroded (MeC3).—This severely eroded soil has lost most of its original surface layer through erosion.

Its present surface layer is finer textured than that described as typical for the series. This soil is more susceptible to erosion than Markland silt loam, 3 to 10 percent slopes. Shallow gullies and gall spots have formed in some small areas.

This soil is better suited to hay and pasture than to other uses. A row crop can be grown occasionally if management is good. (Capability unit IVe–9)

Markland silty clay loam, 20 to 30 percent slopes, severely eroded (MeD3).—This severely eroded soil has a finer textured plow layer than that described as typical for the series. This soil contains less organic matter and has poorer tilth than Markland silt loam, 3 to 10 percent slopes. Further erosion is likely because water is absorbed slowly and the soil is moderately steep.

Included with this soil in mapping were a few small, very severely eroded areas in which gullies and gall spots have formed.

This severely eroded soil is better suited to hay and pasture than to most other uses. (Capability unit VIe–1)

Markland silty clay loam, 30 to 40 percent slopes, severely eroded (MeE3).—This severely eroded soil occurs on steep breaks, mainly as narrow bands around areas of less sloping Markland and McGary soil. Erosion has removed most of the original surface soil, and in places the subsoil is exposed. The profile of this soil is finer textured and shallower to the underlying material than that described as typical for the series.

This soil is well suited to trees. It is too steep and severely eroded to provide good pasture. (Capability unit VIIe–1)

McGary Series

The McGary series consists of deep, somewhat poorly drained to poorly drained soils on terraces. These soils developed on calcareous silt and clay deposited by slack water. They commonly occur near Pettyville and Mineralwells in Wood County and near Newark in Wirt County. Slopes range from 0 to 3 percent.

In a typical profile the plow layer is grayish-brown silty clay loam about 8 inches thick. The subsoil extends to a depth of 36 inches and is distinctly mottled with strong brown between depths of 8 and 22 inches. It is light yellowish-brown silty clay loam to a depth of 12 inches and is light brownish-gray, light olive-brown, and strong-brown silty clay below. The underlying material is strong-brown and light brownish-gray clay.

McGary soils are slowly permeable. The water table is at or near the surface for long periods in winter and spring.

Many areas of these soils are used for hay or pasture. Drainage is needed for good growth of crops.

Typical profile of McGary silty clay loam, in Wood County, at the back of the community building in Mineralwells:

Ap—0 to 8 inches, grayish-brown (2.5Y 5/2-10YR 5/2) light silty clay loam; moderate, medium, granular structure, tending towards weak, medium, platy structure; friable when moist, hard when dry; many roots; very strongly acid; abrupt, smooth boundary; horizon 5 to 8 inches thick.

B1—8 to 12 inches, light yellowish-brown (2.5Y 6/4) silty clay loam; common, fine and medium, distinct mottles of strong brown (7.5YR 5/8); weak, medium and coarse, subangular blocky structure; friable to firm when moist, hard when dry; roots common; strongly acid; clear, wavy boundary; horizon 3 to 5 inches thick.

B21tg—12 to 22 inches, light brownish-gray (2.5Y 6/2) silty clay; many, medium, distinct mottles of strong brown (7.5YR 5/8); moderate coarse prisms, 2 to 5 inches across, breaking to moderate, coarse, subangular blocky structure; firm when moist, slightly sticky and slightly plastic when wet; few roots; coatings of pale-brown (10YR 6/3) clay on some ped faces; common fine pores; strongly acid; clear, wavy boundary; horizon 8 to 14 inches thick.

B22tg—22 to 30 inches, variegated light olive-brown (2.5Y 5/4), strong-brown (7.5YR 5/8), and light brownish-gray (2.5Y 6/2) silty clay; weak coarse prisms, breaking to weak, coarse, subangular blocky structure; firm when moist, slightly sticky and slightly plastic when wet; few roots; light brownish-gray (2.5Y 6/2) coatings and streaks; common fine pores; medium acid; clear, wavy boundary; horizon 6 to 12 inches thick.

B3g—30 to 36 inches, variegated light olive-brown (2.5Y 5/4), strong-brown (7.5YR 5/8), and light brownish-gray (2.5Y 6/2) silty clay; very weak coarse prisms, breaking to very weak, coarse, subangular blocky structure; firm; light brownish-gray (2.5Y 6/2) clay flows and streaks common; few concretions of manganese; medium acid; gradual, wavy boundary; horizon 5 to 8 inches thick.

Cg—36 to 72 inches, strong-brown (7.5YR 5/8) and light brownish-gray (2.5Y 6/2) clay; massive, tending towards weak, coarse, prismatic structure; firm; some coatings of light olive brown (2.5Y 5/4) on ped faces and in root holes; common small concretions of manganese; slightly acid to a depth of about 50 inches, neutral below.

The B horizon is dominantly silty clay but ranges from silty clay loam in the upper part to clay in the lower part. Depth to calcareous soil material is more than 50 inches in most places. The chroma of the B horizon is higher for the McGary soils in Wood and Wirt Counties than is typical for McGary soils in other places.

The McGary soils occur with the moderately well drained Markland soils and the somewhat poorly drained to poorly drained Tygart soils.

McGary silty clay loam (Mg).—This wet soil lacks adequate drainage outlets in some areas. Diversion terraces help in controlling runoff from higher slopes. This soil is well suited to pasture consisting of bluegrass and tall grasses, but it is poorly suited to alfalfa. Slopes range from 0 to 3 percent.

Included with this soil in mapping were small areas of Markland soils, which are better drained. (Capability unit IIIw–5)

Melvin Series

The Melvin series consists of deep, poorly drained soils on bottom lands. These soils are nearly level and slightly depressional. They occur throughout the two counties in areas that parallel streams. Melvin soils developed in alluvium washed mainly from the upland areas that have been affected by lime. Slopes range from 0 to 5 percent, but slopes of 0 to 2 percent are dominant.

In a typical profile the surface layer is 10 inches thick and consists of very dark grayish-brown and dark grayish-brown silt loam mottled with yellowish red. The subsoil, which is 8 inches thick, is very firm, very dark grayish-brown to dark grayish-brown silt loam mottled with yellowish red. The underlying material is mottled grayish-brown and yellowish-red silt loam or silty clay loam.

Melvin soils have moderately slow permeability. They remain wet much of the year, and water ponds in some small areas. Some areas are seldom flooded, but some are frequently flooded.

Many areas of these soils are pastured, but drainage is needed before crops can be grown satisfactorily.

Typical profile of Melvin silt loam, in Wood County, 650 feet east of the Ohio River, 1.2 miles north of Keller Lane in Boaz:

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam; few, fine, distinct mottles of yellowish red (5YR 5/6); weak, fine, granular structure, tending towards thin platy structure; loose; many roots; medium acid; abrupt boundary; horizon 6 to 10 inches thick.

A2—6 to 10 inches, dark grayish-brown (2.5Y 4/2) silt loam; many, fine and medium, prominent mottles of yellowish red (5YR 5/6); weak, thin and medium, platy structure; friable, compact in place; high content of silt; few roots; medium acid; abrupt boundary; horizon 4 to 6 inches thick.

B2g—10 to 18 inches, very dark grayish-brown (10YR 3/2) to dark grayish-brown (10YR 4/2) silt loam; many, fine, distinct mottles of yellowish red (5YR 5/6); weak, fine, granular structure; very firm; few roots; slightly acid; gradual boundary; horizon 6 to 12 inches thick.

C—18 to 36 inches +, mottled grayish-brown (10YR 5/2) and yellowish-red (5YR 5/6) heavy silt loam or silty clay loam; massive, tending towards medium platy structure; firm; slightly acid.

The B2g horizon ranges from heavy silt loam to silty clay loam in texture. In areas along the Ohio River hues of 10YR are dominant, but hues of 7.5YR occur in some areas.

The Melvin soils occur with the well drained Ashton and Huntington soils and the moderately well drained to somewhat poorly drained Lindside soils along the Ohio River. Melvin soils also occur with the well drained Hackers and Moshannon soils and the moderately well drained to somewhat poorly drained Senecaville soils along streams throughout Wood and Wirt Counties.

Melvin silt loam (Ml).—This poorly drained, wet soil receives runoff from higher areas and, in places, needs diversion terraces. Also, it can be improved by artificial drainage, but suitable outlets are lacking in some areas. Drainage outlets are difficult to install. Slopes range from 0 to 5 percent, but slopes of 0 to 2 percent are dominant.

Included with this soil in mapping were small areas that have redder material than Melvin silt loam and areas that are slightly better drained.

This soil is poorly suited to alfalfa. (Capability unit IIIw-1)

Monongahela Series

The Monongahela series consists of deep, moderately well drained soils on terraces. These soils developed in alluvium washed from soils of the upland underlain by acid sandstone and shale. They occur mainly near Lubeck and the Wood County Airport in Wood County and near Elizabeth and Palestine in Wirt County. Most areas are on old high terraces about 125 to 200 feet above the younger terraces that lie along some of the present streams. Some areas are 3 to 5 miles wide and are strongly dissected by many small streams. Slopes range from 0 to 30 percent, but slopes of 6 to 15 percent are dominant.

In a typical profile the plow layer is pale-brown silt loam about 7 inches thick. The subsoil extends to a depth of 40 inches and contains a fragipan layer between depths of 19 and 35 inches. The part of the subsoil above the fragipan consists of yellowish-brown silt loam, the fragipan part consists of yellowish-brown, very firm clay loam distinctly mottled with yellowish red, and the lower part is yellowish-brown firm clay loam. The underlying material is yellowish-red sandy clay loam that contains lenses of silt, sand, and clay and mottles of strong brown.

Monongahela soils are susceptible to sheet and gully erosion. These soils are low in natural fertility, particularly in the content of potash. Permeability is moderately slow.

These soils are suited to the crops commonly grown in the two counties, including hay and pasture. Because of the fragipan, alfalfa and other deep-rooted legumes may not last long. The slopes and a slowly permeable subsoil are limitations to use for homesites.

Typical profile of a Monongahela silt loam having slopes of 3 to 10 percent, in Wood County, about 1,000 feet west of State Route 2, in a housing development at Lubeck:

Ap—0 to 7 inches, brown (10YR 5/3) silt loam, pale brown (10YR 6/3) when dry; weak, fine, granular structure, tending toward thin platy structure; very friable; many roots; strongly acid; abrupt, smooth boundary; horizon 5 to 8 inches thick.

B21t—7 to 12 inches, yellowish-brown (10YR 5/6) heavy silt loam; weak, fine, subangular blocky structure; friable to firm; roots common; pale-brown (10YR 6/3) silt coatings on a few ped faces; strongly acid; clear, wavy boundary; horizon 4 to 6 inches thick.

B22t—12 to 19 inches, yellowish-brown (10YR 5/6) heavy silt loam; weak to moderate, medium, subangular blocky structure; firm; few roots; pale-brown (10YR 6/3) silt coatings and lenses common; a few clay coatings in pores and root holes; strongly acid; clear, wavy boundary; horizon 6 to 10 inches thick.

Bx—19 to 35 inches, yellowish-brown (10YR 5/4) clay loam; common, medium, distinct mottles of yellowish red (5YR 4/8); light brownish-gray (10YR 6/2) silt coatings and streaks; weak, medium, subangular blocky structure in which peds are arranged in coarse prisms; very firm; clay coatings common in pores and along prism faces; very strongly acid; clear, wavy boundary; horizon 12 to 20 inches thick.

B3—35 to 40 inches, yellowish-brown (10YR 5/6) clay loam; common, medium, distinct mottles of yellowish red (5YR 4/8); weak, medium, subangular blocky structure; firm; few clay coatings in pores; very strongly acid; abrupt, wavy boundary; horizon 4 to 7 inches thick.

IIC—40 to 52 inches +, yellowish-red (5YR 5/6) heavy sandy clay loam that has lenses of silt, sand, and clay; common mottles of strong brown (7.5YR 5/8); massive; firm; very strongly acid.

In some areas the A horizon is very silty and indicates the presence of some windblown material. The B21t and B22t horizons range from silt loam to silty clay loam in texture. The Bx and B3 horizons are dominantly clay loam but range to silt loam. These horizons are dominantly yellowish brown in a hue of 10YR, but a hue of 7.5YR is common in some places. In some areas the soil is underlain by stratified silt, sand, and gravel, but locally it is underlain by bedrock or by clay residuum. Depth to mottling ranges from 16 to 24 inches. Bedrock is generally at a depth of more than 5 feet.

The Monongahela soils occur with the well drained Allen soils, the moderately well drained Tilsit and Zoar soils, and the somewhat poorly drained to poorly drained Tygart soils. The Monongahela soils developed from coarser textured material than the Zoar and Tygart soils. Although Monongahela soils commonly do not occur with Tilsit soils, they are similar to them in texture, color, and profile development but are deeper to bedrock.

Monongahela and Tilsit silt loams, 0 to 3 percent slopes (MnA).—This mapping unit consists of Monongahela silt loam and Tilsit silt loam that were mapped together because they are similar in color, texture, and profile development. They also have similar limitations to use and need about the same management. Elsewhere in this section, a profile of a Tilsit silt loam is described as typical for the Tilsit series.

The soils in this mapping unit occur as broad areas on flats and ridgetops. Most areas consist of the Monongahela soil. Generally, these soils have poorer surface drainage and are mottled nearer the surface than Monongahela and Tilsit silt loams, 3 to 10 percent slopes.

Monongahela and Tilsit silt loams, 0 to 3 percent slopes, are suited to most of the crops commonly grown in the two counties. Drainage is needed in some of the small, wet areas. (Capability unit IIw–1)

Monongahela and Tilsit silt loams, 3 to 10 percent slopes (MnB).—Monongahela silt loam makes up more than two-thirds of this mapping unit, though Monongahela and Tilsit silt loams do not occur together in all areas mapped. These Monongahela and Tilsit soils have the profile described as typical for their respective series. Both of these soils generally are mottled at a depth of about 18 inches. Surface runoff is good, but there are some wet spots caused by seepage. Erosion is a moderate hazard in unprotected areas.

Included in mapped areas were a few acres that are severely eroded.

The soils of this mapping unit are suited to most locally grown crops. The hazard of erosion restricts their use for row crops. (Capability unit IIe–13)

Monongahela and Tilsit silt loams, 10 to 20 percent slopes (MnC).—About two-thirds of this mapping unit consists of Monongahela silt loam, and most of the rest is Tilsit silt loam. These soils have a thinner fragipan layer than the one in the profile described as typical for their respective series.

Included with these soils in mapping were areas where the soil is shallower to bedrock, or to the nonconforming underlying material, than is typical of either the Monongahela or Tilsit soil.

These soils are suited to cultivated crops, hay, and pasture. Strong slopes, rapid surface runoff, and a hazard of erosion are limitations to use for row crops. (Capability unit IIIe–13)

Monongahela and Tilsit silt loams, 10 to 20 percent slopes, severely eroded (MnC3).—About two-thirds of this mapping unit is Monongahela silt loam, and most of the rest is Tilsit silt loam. These soils have lost most of their original surface layer through erosion. There are a few gall spots in which the underlying material is exposed in some places. The present plow layer is poorer in tilth and absorbs water more slowly than the plow layer of the Monongahela and Tilsit silt loams, 3 to 10 percent slopes.

Included in mapped areas were a few very severely eroded areas.

These severely eroded soils are better suited to hay and pasture than to row crops, but a row crop can be grown occasionally. (Capability unit IVe–9)

Monongahela and Tilsit silt loams, 20 to 30 percent slopes (MnD).—About two-thirds of this mapping unit is Tilsit silt loam, and most of the rest is Monongahela silt loam. These soils generally occur on dissected terraces and in areas between terraces and the benches of uplands. The profiles of these soils are slightly shallower to underlying material and generally contain a thinner fragipan than those described as typical for the Monongahela and the Tilsit series. The Tilsit soil contains more rock fragments than the less steep Monongahela and Tilsit soils. The hazard of erosion is very severe in unprotected areas.

A row crop can be grown on these soils occasionally, but hay or pasture is a better use. (Capability unit IVe–9)

Monongahela and Tilsit silt loams, 20 to 30 percent slopes, severely eroded (MnD3).—About two-thirds of this mapping unit is Tilsit silt loam, and most of the rest is Monongahela silt loam. These soils occur mainly on dissected terraces and in areas between the terrace levels and benches of uplands. Erosion has removed most of the original surface layer from these soils. The present plow layer has poor tilth and absorbs water more slowly than the plow layer in the profiles described as typical for the Monongahela and Tilsit series. Gall spots are common in the more severely eroded areas, and the underlying material or bedrock is exposed in places.

Included in mapped areas were a few very severely eroded areas of Monongahela and Tilsit soils. Also included were some small areas that have slopes of more than 30 percent.

A vegetative cover is needed to protect these soils from further erosion. (Capability unit VIe–2)

Moshannon Series

The Moshannon series consists of deep, well-drained soils on bottom lands. These soils developed in alluvium that washed from soils of the upland, mainly the Upshur and Muskingum. The Moshannon soils occur along most of the streams in the two counties. Slopes range from 0 to 10 percent, but slopes of 0 to 5 percent are dominant.

In a typical profile the plow layer is dark-brown silt loam 8 inches thick. The subsoil extends to a depth of 32 inches. It is dark reddish-gray, friable silt loam in the upper part and is reddish-brown, firm silty clay loam in the lower part. The underlying material is reddish-brown to yellowish-red sandy clay loam to silty clay loam in its upper 8 inches. Below this it is reddish-brown fine sandy loam that contains lenses of silty material.

Moshannon soils are easy to work. They are moderately permeable, medium acid, and high in natural fertility. These soils are subject to flooding, and the floods vary considerably in frequency.

These soils are used for cultivated crops, hay, and pasture.

Typical profile of Moshannon silt loam, 0 to 3 percent slopes, in Wirt County, in a plowed field near Two Run Church along State Route 14:

Ap—0 to 8 inches, dark-brown (7.5YR 4/2) silt loam; moderate, fine, granular structure; very friable; many fine roots; slightly acid; clear, smooth boundary; horizon 6 to 10 inches thick.

B1—8 to 15 inches, dark reddish-gray (5YR 4/2) silt loam; weak, medium and coarse, subangular blocky structure; friable; many roots; medium acid; clear, wavy boundary; horizon 6 to 9 inches thick.

B2—15 to 32 inches, reddish-brown (5YR 4/4) silty clay loam; weak, medium and coarse, subangular blocky structure; firm; roots common; many pores; coatings on faces of peds; fine and medium concretions of manganese common; medium acid; gradual boundary; horizon 12 to 30 inches thick.

C1—32 to 40 inches, reddish-brown (5YR 4/4) to yellowish-red (5YR 4/6) sandy clay loam to coarse silty clay loam; massive; firm; few roots; coatings on faces of peds; medium acid; gradual boundary; horizon 6 to 10 inches thick.

C2—40 to 60 inches, reddish-brown (5YR 4/3) fine sandy loam that has lenses of silty material; massive; medium acid.

The B horizon ranges from 2 to 3 feet in thickness. In some places gravelly soil material occurs at a depth of about 18 to 26 inches. The C horizon generally is stratified and ranges from fine sandy loam to silty clay loam. In some areas the profile contains larger amounts of silt and sand than that of this soil. Depth to sand or sand and gravel ranges from about 3 to 6 feet.

The Moshannon soils occur with the well drained Hackers soils, the moderately well drained to somewhat poorly drained Senecaville soils, and the poorly drained Melvin soils. The Moshannon soils are flooded more frequently and show less profile development than Hackers soils.

Moshannon silt loam, 0 to 3 percent slopes (MoA).—This soil commonly occurs along creeks throughout the two counties. It is flooded about once every 3 years. The profile of this soil is the one described as typical for the series.

This soil is suited to most crops commonly grown in the two counties. Partly because the erosion hazard is only slight, row crops can be grown every year. (Capability unit IIw-6)

Moshannon silt loam, 3 to 10 percent slopes (MoB).—This soil is moderately susceptible to erosion. In a few included areas slopes are more than 10 percent.

This soil is suited to most crops commonly grown in the two counties. Row crops can be grown every year if management is good. (Capability unit IIw-6)

Moshannon silt loam, low bottom (Ms).—This soil is subject to flooding at least 2 years out of 3, and some areas are flooded each year. The profile of this soil is slightly coarser textured than that described as typical for the series. This soil is flooded more frequently than Moshannon silt loam, 0 to 3 percent slopes. It is stratified with silt and sand in places. Slopes range from 0 to 3 percent.

Because of the flooding hazard, this soil is not suited to row crops and hay. (Capability unit Vw-1)

Moshannon silt loam, coarse subsoil variant (Mt).—This soil commonly occurs along the smaller streams in the two counties. Slopes range from 0 to 10 percent, but slopes of 2 to 5 percent are dominant. The profile of this soil is similar to that described as typical for the series, but it contains a gravelly subsoil between depths of 18 and 26 inches, and it has a seasonal high water table.

This soil is suited to most crops commonly grown in the two counties. Because of the seasonal high water table, alfalfa and other deep-rooted legumes may be damaged. (Capability unit IIw-7)

Muskingum Series

The Muskingum series consists of well-drained, moderately deep soils on uplands. These soils developed on acid, interbedded sandstone, siltstone, and shale. These soils occupy the slopes in the Volcano area of Wood County. They also occur on narrow ridgetops, rounded knobs, and slopes throughout both Wood and Wirt Counties. Slopes range from 10 to 55 percent, but slopes of 25 to 35 percent are dominant.

In a typical profile the surface layer is silt loam about 8 inches thick. It is very dark gray in the upper part and yellowish-brown in the lower part. The subsoil extends to a depth of 26 inches and consists of yellowish-brown and light yellowish-brown silt loam. The underlying material is fractured, interbedded sandstone, siltstone, and shale and light yellowish-brown silt loam. The silt loam makes up about 15 percent of this layer. Fractured bedrock is at a depth of about 33 inches.

Muskingum soils are moderate in natural fertility and are strongly acid to very strongly acid. Permeability is moderate to moderately rapid. These soils are somewhat droughty.

Where slopes are suitable for farming, these soils are used for the crops commonly grown in the two counties. A large area in the vicinity of Sand Hill is almost entirely wooded.

Typical profile of Muskingum silt loam, 40 to 55 percent slopes, in Wood County, in a wooded area 200 yards south of U.S. Highway No. 50, and about 425 yards west of the Ritchie County line:

O1—1¾ inches to ¾ inch, leaves, mainly from oak, hickory, and poplar trees.

O2—¾ inch to 0, decomposed leaves.

A1—0 to 3 inches, very dark gray (10YR 3/1) silt loam; weak, fine, granular structure; loose; many roots; slightly acid; abrupt, wavy boundary; horizon 2 to 4 inches thick.

A2—3 to 8 inches, dark yellowish-brown (10YR 3/4) silt loam; weak, medium, granular structure; very friable; many roots; 10 to 20 percent of horizon is stone fragments as much as 3 inches across; some material from A1 horizon in root holes; medium acid; clear, wavy boundary; horizon 3 to 6 inches thick.

B2—8 to 18 inches, yellowish-brown (10YR 5/4 to 5/6) silt loam; weak, medium, subangular blocky structure; friable when moist, somewhat firm in place; many roots; 30 percent of horizon is small stone fragments; very strongly acid; gradual, wavy boundary; horizon 8 to 14 inches thick.

B3—18 to 26 inches, light yellowish-brown (10YR 6/4) light silt loam; very weak, fine and medium, subangular blocky structure; friable, somewhat firm in place; few roots; 75 percent of horizon is stone fragments as much as 3 inches across; very strongly acid; gradual, irregular boundary; horizon 4 to 8 inches thick.

C—26 to 33 inches, fractured, interbedded sandstone, siltstone, and shale and light silt loam that makes up 15 percent of horizon, by volume; massive; firm; very strongly acid; diffuse boundary; horizon 0 to 8 inches thick.

R—33 inches +, fractured, interbedded siltstone, shale, and sandstone.

In most places the B horizon is silt loam in a hue of 10YR, but in areas where Mushingum soils are closely intermingled with Upshur soils this horizon is loam or light silty clay loam in a hue of 7.5YR. In the B2 horizon, stone fragments make up from 20 to 50 percent of the soil mass, but generally they make up from 20 to 30 percent. In some places, the C horizon contains stone fragments as much as 6 inches across. The rock fragments in the profile are mainly of sandstone and siltstone.

The Muskingum soils occur with the moderately well drained Tilsit soils and the well drained Upshur soils. Muskingum soils lack the fragipan that is typical for Tilsit soils and are shallower to bedrock and contain more stone fragments than those soils. Also, internal drainage is more rapid in the Muskingum soils than in the Tilsit.

Muskingum silt loam, 10 to 20 percent slopes (MuC).—This soil commonly occurs on broad ridgetops and benches. The upper part of the subsoil contains fewer stone fragments than that of the profile described as typical for the series.

Included with this strongly sloping soil in mapping were a few acres of a gently sloping soil and a few small areas of soil that have a moderately well developed subsoil of silty clay loam.

Because the hazard of erosion is severe in unprotected fields, use of the soil for row crops is restricted. (Capability unit IIIe–10)

Muskingum silt loam, 10 to 20 percent slopes, severely eroded (MuC3).—This strongly sloping soil has lost most of its original surface layer through erosion. The present plow layer is a mixture of original surface soil and subsoil material. This layer is low in organic-matter content and generally is in poor tilth.

Included with this soil in mapping were a few small areas of a soil that has a moderately well developed subsoil of silty clay loam.

This strongly sloping soil can be used for a row crop occasionally, but it is better suited to hay and pasture. (Capability unit IVe–3)

Muskingum silt loam, 20 to 30 percent slopes (MuD).—This soil generally occurs on ridgetops, rounded knobs, and benches. Surface runoff is rapid, and the hazard of erosion is severe in unprotected areas.

Included with this soil in mapping were a few small areas of a soil that has a moderately well developed subsoil of silty clay loam texture.

Muskingum silt loam, 20 to 30 percent slopes, is suited to hay and pasture. A row crop can be grown occasionally if management is good. (Capability unit IVe–3)

Muskingum silt loam, 20 to 30 percent slopes, severely eroded (MuD3).—This severely eroded soil has lost most of its original surface layer through erosion. The present surface layer contains less organic matter and is in poorer tilth than that of Muskingum silt loam, 40 to 55 percent slopes.

Included with this soil in mapping were a few acres of Muskingum soils that are very severely eroded and a few acres of a shallow soil. Also included were a few areas of soils that have a moderately well developed subsoil of silty clay loam. In included areas in coves, the soils were deeper than Muskingum silt loam, 20 to 30 percent slopes, severely eroded.

This soil is suited to hay and pasture if management is good. (Capability unit VIe–2)

Muskingum silt loam, 30 to 40 percent slopes (MuE).—Except that the profile of this soil is less steep and is deeper to underlying material, it is similar to that described as typical for the series. Erosion, however, is a very severe hazard in unprotected areas.

Included with this soil in mapping, mainly on high knobs and narrow ridgetops, were a few areas of a soil that has a sandy loam surface layer. In other included areas in coves the soil was deeper than Muskingum silt loam, 30 to 40 percent slopes.

This soil is suitable as woodland and should remain in trees. (Capability unit VIIe–2)

Muskingum silt loam, 30 to 55 percent slopes, severely eroded (MuF3).—This steep to very steep soil has lost most of its original surface layer through erosion. The present surface layer absorbs water more slowly and contains less organic matter than that of Muskingum silt loam, 40 to 55 percent slopes. Because this soil absorbs water slowly and surface runoff is rapid, it is very susceptible to erosion.

Included with this soil in mapping, mainly on narrow ridgetops and high knobs, were a few small areas of shallow soils and of sandy soils.

This severely eroded soil is better suited to trees than to other uses. (Capability unit VIIe–2)

Muskingum silt loam, 40 to 55 percent slopes (MuF).—This very steep soil occupies narrow ridgetops and areas between benches and along valley walls. It has the profile described as typical for the series.

Included with this soil in mapping were a few acres of a severely eroded Muskingum soil and, on the narrow ridgetops and the upper part of long slopes, a few acres of shallow and sandy soils. Also included in coves were areas of soils that are deeper than is typical for Muskingum soils.

Because of steepness, this soil is better suited to trees than to other uses. (Capability unit VIIe–2)

Sciotoville Series

The Sciotoville series consists of deep, moderately well drained soils on terraces along the Ohio River. These soils developed in glacial outwash material that apparently was deposited by the Ohio River. These soils occur in Wood County commonly as long, narrow areas on terraces that parallel the Ohio River. Slopes range from 0 to 10 percent, but slopes of 0 to 5 percent are dominant.

In a typical profile the plow layer is very dark grayish-brown silt loam 10 inches thick. The subsoil extends to a depth of 46 inches and contains a fragipan between depths of 22 and 32 inches. The subsoil is dark yellowish-brown, friable loam in the upper part, yellowish-brown, firm silt loam in the middle part, and dark yellowish-brown, friable fine sandy loam in the lower part. The fragipan and the lower 12 to 20 inches of the subsoil contains mottles of strong brown, light brownish gray, and pale brown. The underlying material is dark yellowish-brown, very friable loamy fine sand.

Sciotoville soils are moderate in natural fertility. Permeability is moderately slow.

These soils are used for hay, pasture, and most of the cultivated crops commonly grown in the two counties. Alfalfa grows well in the better drained areas.

Typical profile of Sciotoville silt loam, 0 to 3 percent slopes, in Wood County, in a hayfield just below the Du Pont plant:

Ap—0 to 10 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure;

friable; many fine roots; slightly acid; abrupt, smooth boundary; horizon 6 to 10 inches thick.

B1—10 to 15 inches, dark yellowish-brown (10YR 4/4) heavy loam; weak, coarse, granular structure, or weak, fine, subangular blocky structure; friable; many roots; many pores; root channels filled with material from Ap horizon; medium acid; clear, wavy boundary; horizon 3 to 6 inches thick.

B2—15 to 22 inches, yellowish-brown (10YR 5/4) heavy silt loam; moderate, medium, subangular blocky structure; firm; common roots; few patchy clay coatings on ped faces; medium acid; gradual, wavy boundary; horizon 6 to 10 inches thick.

Bx—22 to 32 inches, yellowish-brown (10YR 5/6) heavy silt loam; few, fine and medium, distinct mottles of strong brown (7.5YR 5/6), light brownish gray (10YR 4/2) and pale brown (10YR 6/3); weak, medium, subangular blocky structure; firm; few fine roots; few patchy clay coatings on ped faces; medium acid; clear, wavy boundary; horizon 8 to 12 inches thick.

B3—32 to 46 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; few, medium, distinct mottles of strong brown (7.5YR 5/6), light brownish gray (10YR 6/2), and pale brown (10YR 6/3); weak, medium to coarse, subangular blocky structure; friable; strongly acid; clear, wavy boundary; horizon 12 to 20 inches thick.

IIC—46 to 60 inches, dark yellowish-brown (10YR 4/4) loamy fine sand; very friable; strongly acid.

The B horizon is dominantly silt loam, but in some areas the B2 and Bx horizons are light silty clay loam and the B3 horizon is loam. In reaction the B horizon ranges from medium acid to very strongly acid. Depth to mottling ranges from 16 to 24 inches. The depth to sand or sand and gravel ranges from 3 to 5 feet. In Wood and Wirt Counties, the Sciotoville soils do not contain the mottles of low chroma within 16 inches of the surface, which is typical of Sciotoville soils in other places.

The Sciotoville soils occur with the well-drained Wheeling soils and the poorly drained Ginat soils. They are better drained than the Ginat soils. Sciotoville soils are less well drained than the Wheeling soils and contain a fragipan, which is lacking in the Wheeling soils.

Sciotoville silt loam, 0 to 3 percent slopes (ScA).—Erosion is only a slight hazard on this nearly level soil. The profile is the one described as typical for the series.

Included with this soil in mapping were small areas that are wet.

This soil is suited to crops, grasses, and legumes. Drainage of the small, wet areas is beneficial. (Capability unit IIw-1)

Sciotoville silt loam, 3 to 10 percent slopes (ScB).—Runoff is slightly more rapid and erosion is more likely in unprotected areas of this soil than on the nearly level Sciotoville soils. The fragipan in this soil is thinner and slightly less well developed than in the profile described as typical for the series.

Included with this soil in mapping were a few acres of strongly sloping Sciotoville soils. Also included, near the Lakin soils, were a few acres of Sciotoville soils that are slightly coarser textured and are above the normal level of Sciotoville soils.

This soil is suited to cultivated crops and to hay and pasture. Because of runoff and the hazard of erosion, its use for row crops is limited. (Capability unit IIe-13)

Senecaville Series

The Senecaville series consists of deep, moderately well drained to somewhat poorly drained soils on bottom lands. These soils developed in material that washed from soils of the upland, mainly the Upshur and Muskingum. Senecaville soils occur along most of the streams in Wood and Wirt Counties.

In a typical profile the plow layer is dark-brown to brown silt loam 7 inches thick. The subsoil extends to a depth of 22 inches. It consists of dark reddish-brown to reddish-brown, friable silt loam in the upper part and of reddish-brown to yellowish-red, firm silty clay loam in the lower part. The underlying material, to a depth of 36 inches, is reddish-brown silty clay loam that is distinctly mottled with yellowish red and contains lenses of sandy material. Below this is stratified silt and fine sand.

Senecaville soils are moderately high in natural fertility. Some areas are flooded occasionally, and other areas are flooded frequently. The water table is seasonally high.

These soils are used for hay, pasture, and most of the cultivated crops commonly grown in the two counties. Suitability for deep-rooted legumes is somewhat limited by impeded drainage. Flooding and a high water table limit use for industrial sites and homesites.

Typical profile of Senecaville silt loam, in Wood County, in a hayfield along the North Fork of Lee Creek, one-half mile west of Wadeville:

Ap—0 to 7 inches, dark-brown (7.5YR 4/2) silt loam, brown (7.5YR 5/4) when dry; moderate, medium, granular structure; friable when moist, hard when dry; many roots; medium acid; clear boundary; horizon 6 to 9 inches thick.

B1—7 to 12 inches, dark reddish-brown (5YR 3/4) silt loam, reddish brown (5YR 4/3) when dry; weak, coarse, subangular blocky structure; friable when moist, hard when dry; roots common; medium acid; gradual boundary; horizon 4 to 8 inches thick.

B2—12 to 22 inches, reddish-brown (5YR 4/4) to yellowish-red (5YR 4/6) silty clay loam; weak, medium to coarse, subangular blocky structure; firm; common roots; few fine and medium coatings and concretions of manganese; medium acid; gradual boundary; horizon 8 to 15 inches thick.

C1—22 to 36 inches, reddish-brown (5YR 4/3) silty clay loam; common, fine and medium, distinct mottles of yellowish red (5YR 5/6 to 5/8); massive; few roots; lenses of sandy material; medium and coarse coatings and concretions of manganese; common; medium acid.

C2—36 to 42 inches +, stratified silt and fine sand.

Depth to mottling ranges from 16 to 24 inches. More silt and sand occurs in profiles in lower areas than in profiles in higher areas. Depth to silt and sand ranges from about 3 to 6 feet.

The Senecaville soils occur with the well-drained Hackers and Moshannon soils and the poorly drained Melvin soils.

Senecaville silt loam (Se).—This soil is flooded every 3 or 4 years in some areas but is seldom flooded in other areas. It has the profile described as typical for the series. Slopes range from 0 to 5 percent.

This soil is moderately fertile and is easily worked. It is suited to cultivated crops and to hay and pasture. Drainage of small local areas helps to insure the growth of crops on this soil. (Capability unit IIw-7)

Senecaville silt loam, low bottom (Sn).—This soil is subject to flooding 2 years out of 3 in most areas, but some of the lower areas are flooded every year. Slopes range from 0 to 3 percent. This soil has a profile similar to the one described as typical for the series, but it is more frequently flooded, and in some areas is slightly coarser textured than the typical soil.

Good pasture can be established on this soil if management is good. Because of the hazard of flooding, it is not suited to row crops and is not well suited to hay. (Capability unit Vw–1)

Steep Land, Alluvial Materials

Steep land, alluvial materials (StF) is steep to very steep. It occurs as narrow bands along the banks of streams near the Moshannon, Hackers, and Huntington soils and along the western edge of the Wheeling soils. It also occurs on breaks along drainageways in areas near Allen soils that are strongly dissected. Most of the acreage lies idle or is wooded. (Capability unit VIIe–1)

Tilsit Series

The Tilsit series consists of deep, moderately well drained soils on uplands. These soils developed on acid sandstone, siltstone, and shale. They occupy many of the broad ridgetops and benches in the higher areas of the two counties. Slopes range from 2 to 30 percent, but slopes of 6 to 15 percent are dominant.

In a typical profile the surface layer is light olive-brown and light yellowish-brown silt loam that is about 9 inches thick and is covered with about 1 inch of pine needles and hardwood leaves and about 1 inch of black, decomposed pine needles and matted partly decayed leaves. The subsoil extends to a depth of 34 inches. It contains a fragipan between depths of 24 and 34 inches and is mottled with light gray between depths of 15 and 34 inches. The subsoil is yellowish-brown, friable to firm silt loam in the upper part, is yellowish-brown, firm silty clay loam in the middle part, and is strong-brown, very firm silt loam in the lower part. The underlying material is strong-brown silt loam, of which about 30 percent is siltstone and fine-grained sandstone. This layer is distinctly mottled with very pale brown.

Tilsit soils are low in natural fertility. Permeability is moderately slow in the lower part of the subsoil.

These soils are used for most of the crops commonly grown in the two counties. Alfalfa and other deep-rooted legumes may not last long, because the fragipan is slowly permeable.

Typical profile of Tilsit silt loam, 3 to 10 percent slopes, in Wood County, in a wooded area of an old field, about 2 miles northeast of Walker and about one-half mile northwest of Walker Creek:

O1—2 inches to 1 inch, pine needles and some hardwood leaves.

O2—1 inch to 0, black, decomposed pine needles and matted, partly decomposed leaves.

Ap—0 to 5 inches, light olive-brown (2.5Y 5/4) silt loam; weak, fine, granular structure; friable; many roots; strongly acid; abrupt, wavy boundary; horizon 5 to 8 inches thick.

A2—5 to 9 inches, light yellowish-brown (2.5Y 6/4) silt loam; weak, fine, granular structure; friable; many roots; strongly acid; clear, wavy boundary; horizon 4 to 6 inches thick.

B21t—9 to 15 inches, yellowish-brown (10YR 5/6) heavy silt loam; weak, fine, subangular blocky structure; friable to firm; few light yellowish-brown (10YR 6/4) coatings; common roots; strongly acid; clear, wavy boundary; horizon 5 to 10 inches thick.

B22t—15 to 24 inches, yellowish-brown (10YR 5/6) light silty clay loam; few, medium, faint mottles of light gray (10YR 7/2); weak to moderate, fine and medium, subangular blocky structure; firm; few roots; strongly acid; clear, wavy boundary; horizon 6 to 10 inches thick.

Bx—24 to 34 inches, strong-brown (7.5YR 5/6) silt loam; many, medium, distinct mottles of light gray (10YR 7/2); massive that breaks to platy structure; very firm; few roots; strongly acid; gradual, wavy boundary; horizon 8 to 20 inches thick.

C—34 to 40 inches, strong-brown (7.5YR 5/6) silt loam; many, medium, distinct mottles of very pale brown (10YR 7/3); massive; 30 percent of horizon is siltstone and fine-grained sandstone.

In areas on benches, the B horizon generally contains more rock fragments than is typical of Tilsit soils. Depth to mottling ranges from 15 to 24 inches. The fragipan occurs at depths ranging from 18 to 26 inches. Depth to bedrock ranges from 3 to 5 feet.

Tilsit soils occur with the moderately well drained Monongahela soils and the well drained Muskingum soils. They are similar to Monongahela soils in color, texture, and profile development but are shallower to bedrock. Tilsit soils have a fragipan and are deeper than Muskingum soils and are not so well drained.

Tygart Series

The Tygart series consists of deep, somewhat poorly drained to poorly drained soils on terraces. These soils developed in acid silt and clay deposited by slack water. They occur near Pettyville, Butcher Bend, and Leachtown in Wood County and near Palestine and Center Hill in Wirt County. Slopes range from 0 to 10 percent, but slopes of 0 to 3 percent are dominant.

In a typical profile the plow layer is 5 inches thick and consists of grayish-brown silt loam that is distinctly mottled with yellowish red. The subsoil extends to a depth of 22 inches and is mottled with yellowish brown. It is light yellowish-brown silt loam in the upper part, is light yellowish-brown silty clay loam in the middle part, and is light brownish-gray silty clay in the lower part. The underlying material is mottled, light brownish-gray and yellowish-brown silty clay.

Tygart soils are strongly acid to very strongly acid. Because they are slowly permeable and have poor surface drainage, they remain wet until late in spring.

These soils are used mainly for hay and pasture. Drainage is needed if cultivated crops are grown.

Typical profile of Tygart silt loam, in Wood County, on the 4–H Club grounds at Butcher Bend:

Ap—0 to 5 inches, grayish-brown (2.5Y 5/2) silt loam; few, fine, distinct mottles of yellowish red (5YR 4/6), mainly in root holes; weak, fine, granular structure; friable when moist, slightly plastic when wet; many fine roots; medium acid; abrupt boundary; horizon 4 to 8 inches thick.

B1—5 to 10 inches, light yellowish-brown (2.5Y 6/4) silt loam; few, fine, faint mottles of yellowish brown (10YR 5/8); weak, fine, subangular blocky structure, tending towards thin platy structure; friable when moist, slightly plastic when wet; few fine roots; old root channels or worm borrows filled with material from Ap horizon; many pores; moderate to strongly acid; clear boundary; horizon 4 to 6 inches thick.

B2t—10 to 17 inches, light yellowish-brown (2.5Y 6/4) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); weak, medium, distinct mottles of yellowish brown (10YR 5/8); weak, medium and coarse, prismatic structure; firm when moist, slightly plastic when wet; few fine roots; many pores, continuous clay coats; strongly acid; clear boundary; horizon 6 to 10 inches thick.

B3t—17 to 22 inches, light brownish-gray (2.5Y 6/2) silty clay; many, medium, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, subangular blocky structure; firm when moist, plastic and slightly sticky when wet; few fine roots; many pores; strongly acid; horizon 4 to 8 inches thick.

C—22 to 34 inches +, mottled, light brownish-gray (2.5Y 6/2), and yellowish-brown (10YR 5/8) silty clay; massive, tending towards weak, coarse, prismatic structure; very firm; many pores; strongly acid.

The B2t and B3t horizons range from silty clay loam to clay, and in some places they contain pockets of sand and gravel. Where they occur with the Cotaco soils, Tygart soils contain a few pebbles throughout the profile and the B horizon is clay loam to silt loam in some places.

Tygart soils occur with the moderately well drained Cotaco, Markland, Monongahela, and Zoar soils. They are finer textured in part of the subsoil than the Cotaco and Monongahela soils, and they lack the fragipan that is characteristic of Monongahela soils.

Tygart silt loam (Ty).—This wet soil is suited to hay and pasture. If it is drained, it is also suited to most of the crops commonly grown in the two counties. It is not well suited to alfalfa and other deep-rooted legumes. Slopes of 0 to 3 percent are dominant. (Capability unit IIIw-5)

Upshur Series

The Upshur series consists of deep, or moderately deep well-drained soils of the uplands. These soils developed mainly on red, reddish-brown, and olive-brown calcarous, soft clay shale. They occur on many of the smooth ridgetops, knobs, and saddles throughout Wood and Wirt Counties. Slopes range from 3 to 30 percent, but slopes of 15 to 25 percent are dominant.

In a typical profile of a severely eroded area, the plow layer is reddish-brown silty clay about 6 inches thick. The subsoil extends to a depth of 42 inches and consists of reddish-brown, dark reddish-brown, and weak-red, very sticky and very plastic clay. Fragments of red shale make up 10 to 15 percent of the lower part of the subsoil. The subsoil is underlain by weak-red and pinkish-gray clay. Bedrock is at a depth of about 54 inches.

Upshur soils are difficult to work. Water moves through them slowly, and they puddle if worked when wet. Natural fertility is moderately high.

These soils are poorly suited to row crops, but they are well suited to grasses and legumes. Because Upshur soils are unstable and have high shrink-swell potential, they have severe limitations for use as septic tank filter fields and for many other engineering uses.

Typical profile of Upshur silty clay in Upshur-Muskingum complex, 20 to 30 percent slopes, severely eroded, in Wirt County, in a wooded area along a road about 1⅓ miles northeast of State Route 5 and about 1 mile northwest of Cherry:

01—2½ inches to ½ inch, pine needles and leaf litter from hardwoods.

02—½ inch to 0, matted, partly decomposed hardwood leaves and pine needles.

Ap—0 to 6 inches, reddish-brown (5YR 4/4) silty clay; moderate, fine, granular structure and weak to moderate, fine, subangular blocky structure; somewhat firm; many roots; some material from 02 horizon in cracks; strongly acid; clear, wavy boundary; horizon 4 to 8 inches thick.

B21t—6 to 19 inches, reddish-brown (2.5YR 4/4) clay; moderate to strong, medium and coarse, angular and subangular blocky structure; vertical axis of subangular blocks longer than horizontal; firm when moist, very hard when dry, very sticky and very plastic when wet; many roots; continuous reddish-brown (5YR 4/4) clay films; medium acid; clear, wavy boundary; horizon 10 to 15 inches thick.

B22t—19 to 32 inches, reddish-brown to dark reddish-brown (2.5YR 4/4–3/4) clay; moderate to strong, medium, subangular blocky structure; coarse subangular blocks with vertical axis longer than horizontal; firm when moist, very hard when dry, very sticky and very plastic when wet; roots common; continuous reddish-brown (5YR 4/4) clay films; 5 to 10 percent of horizon is soft fragments of red shale; medium acid; clear, wavy boundary; horizon 8 to 14 inches thick.

B3—32 to 42 inches, weak-red to reddish-brown (2.5YR 4/2–4/4) clay; moderate, fine and medium, subangular blocky structure; vertical axis of blocks longer than horizontal; firm when moist, very hard when dry, very sticky and very plastic when wet; few roots; 10 to 15 percent of horizon is fragments of red shale as much as one-half inch across; a few smooth surfaces about 2 inches across similar to slickensides; medium acid; clear, wavy boundary; horizon 8 to 12 inches thick.

C—42 to 54 inches, weak-red (2.5YR 4/2) and pinkish-gray (5YR 6/2) clay; massive; some weak breakage inherited from shale; few roots; horizon is 70 percent strongly weathered light olive-brown (2.5Y 5/4) shale, which apparently weathers to red clay; many coarse coatings of manganese; medium acid; clear, wavy boundary; horizon 10 to 16 inches thick.

R—54 inches +, light olive-brown (2.5Y 5/4) shale and siltstone.

In this profile cracks ⅛ to ¼ inch wide extend from the top of the Ap horizon to the top of the C horizon. These cracks form irregular polygons 8 to 12 inches across.

The Ap horizon of Upshur soils ranges from silty clay to silty clay loam and from dark brown (7.5YR 4/2) to dark grayish brown (2.5YR 4/2), reddish brown (5YR 4/4), or dark reddish brown (2.5YR 3/4). The B horizon is dominantly clay but ranges to silty clay loam. Its color ranges from reddish brown in a hue of 2.5YR and 5YR to weak red and dusky red in a hue of 10R to 2.5YR. Depth to bedrock ranges from about 2½ to 6 feet. In a few places these soils are underlain by acid, gray sandstone, siltstone, and shale.

The following chemical and moisture data were obtained at the Soil Survey Laboratory, Beltsville, Md., in tests on samples of a selected profile of Upshur silty clay. To a depth of 54 inches the profile sampled is similar to the one described as representative of the Upshur series, but at that depth the profile sampled has a silty clay C2 horizon that extends to a depth of 73 inches.

In the profile sampled, pH values range from 4.7 in the Ap horizon to 7.7 in the C2. Organic carbon decreases with depth; it ranges from 1.38 percent in the Ap horizon to 0.03 percent in the C2 horizon. Free iron oxide increases with depth; it ranges from 2.5 percent in the Ap horizon to 4.1 percent in the C2. The cation-exchange capacity, in milliequivalents per 100 grams of soil, also increases with depth; it ranges from 27.2 in the Ap horizon to 49.8 in the C2. Extractable cations show random variations in most cations. Calcium increases with depth. Base saturation increases with depth; it ranges from 58 percent in the Ap horizon to 100 percent (calcareous) in the C1 and C2 horizons. Extractable aluminum, in milliequivalents per 100 grams of soil, was determined to a depth of 42 inches and is 1.7 in the Ap horizon, 6.5 in the B21, 2.0 in the B22, and 0 in the B3. Bulk density determinations were made on oven-dry material and on material held at 1/3 atmosphere of tension. It is highest in the B22 horizon and lowest in the Ap horizon. Moisture retained at 1/3 atmosphere and 15 atmospheres of tension is highest in the B21 horizon and is lowest in the C2 horizon.

The Upshur soils occur with the well-drained Muskingum, Brooke, and Vandalia soils but are more severely eroded than those soils. Upshur soils are redder and finer textured than Muskingum soils and are redder and less limy than the Brooke. The Upshur soils are not so deep as the Vandalia soils and are finer textured. In addition, they are more sticky and plastic than Vandalia soils and contain fewer fragments of rock.

Upshur silty clay loam, 3 to 10 percent slopes (UcB).—This soil is mainly on knolls and commonly is near the Tilsit soils. Its profile generally is deeper to bedrock than that described as typical for the series. The hazard of erosion is moderate.

This soil is well suited to grasses and legumes if management is good. Because it is difficult to work, its use for row crops is limited. This soil generally occurs in small areas and is managed in the same way as the soils in adjacent areas. (Capability unit IIIe-30)

Upshur silty clay loam, 10 to 20 percent slopes (UcC).—This soil commonly occurs on ridgetops. In most places its profile is deeper to bedrock than the one described as typical for the series.

This soil is well suited to hay and pasture. If management is good, a row crop can be grown occasionally. Because of the slope and the slow movement of water through the soil, runoff is very rapid in cultivated areas. (Capability unit IVe-30)

Upshur silty clay loam, 20 to 30 percent slopes (UcD).—This soil occurs mainly in wooded areas and on slopes facing north and east. Its surface layer is not so fine textured as that in the profile described as typical for the series. This soil generally is shallower than the less steep Upshur soils. Erosion is a severe hazard in unprotected areas.

This soil is well suited to hay and pasture, but runoff is very rapid in cultivated areas. (Capability unit VIe-1)

Upshur silty clay, 10 to 20 percent slopes, severely eroded (UdC3).—This soil has lost much of its original surface layer through erosion. Its present surface layer is a mixture of the original surface soil and material from the subsoil. This layer is finer textured, contains less organic matter, and is more erodible than the surface layer in the uneroded Upshur soils. In most areas this soil is generally deeper to bedrock than Upshur silty clay, 20 to 30 percent slopes, severely eroded.

Upshur silty clay, 10 to 20 percent slopes, severely eroded, is suited to hay and pasture. Row crops can be grown occasionally if management is good. (Capability unit IVe-30)

Upshur silty clay, 20 to 30 percent slopes, severely eroded (UdD3).—This soil has lost most of its original surface layer through erosion, and a few gall spots, slips, and gullies have formed in some places. The present surface layer is fine textured, low in organic-matter content, and absorbs water slowly. This soil has the profile described as typical for the series.

Because this soil is steep and has rapid surface runoff, erosion is a continuing hazard unless a permanent cover of vegetation is maintained. (Capability unit VIe-3)

Upshur-Brooke silty clay loams, 10 to 20 percent slopes (UeC).—About one-half of this mapping unit is Upshur silty clay loam, and most of the rest is Brooke silty clay loam. The profiles of the Upshur and Brooke soils in this mapping unit generally are deeper to bedrock than the profile described as typical for the Upshur series and the Brooke series. A few slips or gullies are in some places, and the hazard of erosion is severe.

Included in areas mapped as this complex were a few acres of gently sloping soils.

The soils of this mapping unit are well suited to hay and pasture. They are difficult to work, but row crops can be grown occasionally if management is good. (Capability unit IVe-30)

Upshur-Brooke silty clay loams, 20 to 30 percent slopes (UeD).—About two-thirds of this mapping unit consists of Upshur silty clay loam, and most of the rest is Brooke silty clay loam.

Included in areas mapped as this complex were small areas of Muskingum soils.

Because of the steep slopes and the hazard of erosion, these soils are not suited to cultivated crops. They are well suited to alfalfa and other deep-rooted legumes. (Capability unit VIe-1)

Upshur-Brooke silty clays, 10 to 20 percent slopes, severely eroded (UhC3).—About one-half of this mapping unit consists of Upshur silty clay, and most of the rest of Brooke silty clay. These soils have a finer textured plow layer, contain less organic matter, and are poorer in tilth than the less severely eroded Upshur and Brooke soils. The profile of the Upshur and Brooke soils of this mapping unit generally is deeper to bedrock than the profile described as typical for the Upshur and Brooke series.

Included with this complex in mapping were a few acres of very severely eroded Upshur and Brooke soils.

The soils of this mapping unit are limited in their use for row crops. (Capability unit IVe-30)

Upshur-Brooke silty clays, 20 to 30 percent slopes, severely eroded (UhD3).—This mapping unit consists of well-drained Upshur and Brooke soils on benches and ridgetops. These soils occur in such small, intricate patterns that it is not practical to map them separately. Upshur soils make up about two-thirds of this mapping unit and are dominant on the benches. These Upshur and Brooke soils have the profile described as typical for their respective series.

These soils have lost most of their original surface layer through erosion, and their present surface layer is a mixture of original surface soil and material from the subsoil. A few gall spots, slips, or gullies are in some places. The plow layer is in poor tilth and absorbs moisture slowly.

Included with this complex in mapping were small areas of Muskingum soils.

The soils of this mapping unit are not suited to cultivated crops. They are well suited to grasses and deep-rooted legumes if management is good. (Capability unit VIe-3)

Upshur-Brooke silty clays, 20 to 30 percent slopes, very severely eroded (UhD4).—Erosion has removed all or almost all of the original surface layer from the soils of this mapping unit. Many gall spots and gullies have formed, but landslips are more common. These soils absorb water slowly and are susceptible to very severe erosion. Upshur soils make up about two-thirds of this mapping unit, and most of the rest is Brooke soils.

Included with this complex in mapping were small areas of Muskingum soils.

These very severely eroded soils are difficult to manage and should be kept in trees. Some areas have limited use as permanent pasture. (Capability unit VIIe–5)

Upshur-Muskingum complex, 3 to 10 percent slopes (UmB).—This mapping unit consists of moderately deep to deep, well-drained Upshur and Muskingum soils on ridgetops and benches. Upshur silty clay loam makes up about three-fourths of this mapping unit, and Muskingum silt loam accounts for most of the rest. These soils occur in such intricate patterns that it is not practical to map them separately. Except for their coarser textured plow layer, the soils in this mapping unit are similar to those in the Upshur-Muskingum complex, 20 to 30 percent slopes, severely eroded.

This mapping unit occupies a small acreage, and in many places it occurs with the Tilsit and Monongahela soils.

The soils of this mapping unit generally are managed in the same way as the soils in adjacent areas. (Capability unit IIe–15)

Upshur-Muskingum complex, 10 to 20 percent slopes (UmC).—About three-fourths of this mapping unit is Upshur silty clay loam, and most of the rest is Muskingum silt loam. This mapping unit is on ridgetops and benches, and it consists of Upshur and Muskingum soils that have a coarser textured plow layer than have the soils in the Upshur-Muskingum complex, 20 to 30 percent slopes, severely eroded. Also the Upshur soils make up a larger acreage. The hazard of erosion is severe in unprotected areas.

Use of these soils for row crops is limited by the slope and hazard of erosion. (Capability unit IIIe–15)

Upshur-Muskingum complex, 10 to 20 percent slopes, severely eroded (UmC3).—Upshur silty clay makes up about three-fourths of this mapping unit, and Muskingum silt loam accounts for most of the rest. Except that the Upshur soils make up a larger part, this mapping unit is similar to the Upshur-Muskingum complex, 20 to 30 percent slopes, severely eroded. Water moves slowly through the soils, and runoff is rapid in unprotected areas.

Use of these soils for row crops is limited by the slope and the hazard of erosion. (Capability unit IVe–15)

Upshur-Muskingum complex, 20 to 30 percent slopes (UmD).—This mapping unit is mainly on ridgetops and benches and generally occurs on slopes that face north and east or in densely wooded areas. About two-thirds of this mapping unit is Upshur silty clay loam, and most of the rest is Muskingum silt loam. These soils occur in such small, mixed patterns that they were not separated in mapping. These soils have a coarser textured plow layer than the soils in the Upshur-Muskingum complex, 20 to 30 percent slopes, severely eroded. The hazard of erosion is severe in unprotected areas.

The use of these soils for row crops is limited by slopes and the hazard of erosion. (Capability unit IVe–15)

Upshur-Muskingum complex, 20 to 30 percent slopes, severely eroded (UmD3).—About two-thirds of this mapping unit is Upshur silty clay, and most of the rest is Muskingum silt loam. This mapping unit occurs on benches and ridges and furnishes most of the meadowland for farms on hills. Erosion has removed most of the original surface layer from the soils, and gall spots, slips, and gullies are common in some places. In some areas the Muskingum soil is somewhat finer textured than the soil that has the profile described as typical for the Muskingum series. Runoff is rapid, and the hazard of erosion is very severe.

The soils of this mapping unit are better suited to pasture than to hay, but hay can be grown. (Capability unit VIe–3)

Upshur-Muskingum complex, 20 to 30 percent slopes, very severely eroded (UmD4).—This mapping unit occurs mainly on benches throughout the two counties. It consists of soils that have lost all or almost all of their original surface soil through erosion. Gall spots, slips, and gullies are common, but slips are dominant. About two-thirds of this mapping unit is Upshur silty clay, and most of the rest is Muskingum silt loam. The hazard of erosion is more severe on these soils than is typical for Upshur and Muskingum soils.

Some areas of these very severely eroded soils are suited to bluegrass, and the soils have limited use for pasture if management is good. (Capability unit VIIe–5)

Upshur-Muskingum complex, 30 to 40 percent slopes (UmE).—This mapping unit occurs mainly in smooth, wooded areas and in areas on slopes that face north and east where the Muskingum soils have strongly influenced the soils. Upshur silty clay loam makes up about two-thirds of this mapping unit, and Muskingum silt loam accounts for most of the rest. These Upshur and Muskingum soils show more mixing of soil material than those of the Upshur-Muskingum complex, 20 to 30 percent slopes, severely eroded. There are a few stones in some places.

Included with this complex in mapping were a few small areas of Brooke soils.

The soils of this mapping unit are too steep for hay or cultivated crops. They are suited to pasture if management is good. (Capability unit VIe–3)

Upshur-Muskingum complex, 30 to 40 percent slopes, severely eroded (UmE3).—About two-thirds of this mapping unit is Upshur silty clay, and most of the rest is Muskingum silt loam. These soils have lost most of their original surface layer through erosion. The present surface layer absorbs water slowly, and runoff is rapid in unprotected areas. Bedrock is exposed in some areas and a few stones are on the surface in some places. The soils in this complex show more mixing than do the soils in Upshur-Muskingum complex, 20 to 30 percent slopes, severely eroded.

Included with this complex in mapping were a few small areas of Brooke soils.

Because of steepness and the hazard of erosion, the soils of this mapping unit are better suited to trees than to pasture. (Capability unit VIIe–1)

Upshur-Muskingum complex, 30 to 55 percent slopes, very severely eroded (UmF4).—About two-thirds of this mapping unit is Upshur silty clay, and most of the rest is Muskingum silt loam. Erosion has removed all or almost all of the original surface layer from these soils. Gall spots, slips, and gullies are common, bedrock is exposed in many places, and a few stones occur in areas below the bedrock. On the soils in this complex, gall spots and gullies are more common than on the soils of the Upshur-Muskingum complex, 20 to 30 percent slopes, very severely eroded, and erosion is more severe than is typical for Upshur-Muskingum soils.

Included with the complex in mapping were a few small areas of Brooke soils.

The soils of this mapping unit are poorly suited to pasture because of roughness and past erosion; they are better suited to trees. (Capability unit VIIe–5)

Upshur-Muskingum complex, 40 to 55 percent slopes (UmF).—This mapping unit occurs mainly in wooded areas along breaks beneath ridgetops, between bench levels, and along valley walls throughout Wood and Wirt Counties. A small acreage occurs as open areas along slopes that face north and in areas where the soils are strongly influenced by gray sandstone and shale. About one-half of this mapping unit is Upshur silty clay loam; and most of the rest is Muskingum silt loam. Generally, these Upshur and Muskingum soils are shallower, especially those beneath ridgetops and near the top of long slopes, than are the soils of the Upshur-Muskingum complex, 20 to 30 percent slopes, severely eroded. A few stones and outcrops of rock occur along some of the valley walls.

Included with this complex in mapping were a few small areas of Brooke soils.

The soils of this mapping unit are too steep to be used for pasture, but they are suitable as woodland. (Capability unit VIIe–1)

Upshur-Muskingum complex, 40 to 55 percent slopes, severely eroded (UmF3).—About one-half of this mapping unit is Upshur silty clay, and most of the rest is Muskingum silt loam. This mapping unit consists of soils that have lost most of their original surface layer through erosion. Gall spots, slips, gullies, and exposed bedrock are common in some small, local areas. On these soils, runoff is rapid in unprotected areas.

Included with this complex in mapping were a few small areas of Brooke soils.

The soils of this mapping unit are better suited to trees than to other uses. (Capability unit VIIe–1)

Upshur-Muskingum very stony complex, 30 to 55 slopes (UvF).—This mapping unit consists of very stony Upshur and Muskingum soils in about equal acreages. These soils generally occur on bluffs along streams. Rock ledges are common. These soils are moderate in organic-matter content and hold moisture fairly well.

The soils of this mapping unit are mostly wooded. It is advisable to lay out skid roads so that runoff does not flow down the roads and cut gullies in them. (Capability unit VIIs–1)

Vandalia Series

The Vandalia series consists of deep, well-drained soils. These soils developed in colluvium washed from areas of Upshur and Muskingum soils. Vandalia soils are scattered throughout Wood and Wirt Counties and commonly occur in areas adjacent to bottom lands, on terraces, and around the heads of streams (fig. 9). Slopes range from 3 to 40 percent, but slopes of 18 to 25 percent are dominant.

In a typical profile the plow layer is dark-brown silty clay loam about 5 inches thick. The subsoil extends to a depth of 43 inches. It is reddish-brown and yellowish-red silty clay loam in the upper part and is reddish-brown silty clay in the lower part. The underlying material is weak-red clay. Rock fragments occur throughout the profile.

Vandalia soils are moderately high in natural fertility. Permeability is slow. A few wet seepage spots occur. The hazard of erosion is severe.

These soils are used for hay and pasture and for most of the crops commonly grown in the two counties. They are well suited to legumes and grasses if management is good. The severe hazard of erosion limits their use for row crops. Slippage, moderately slow and slow permeability, and a high shrink-swell potential are limitations to use for roads and houses.

Typical profile of Vandalia silty clay loam, 20 to 30 percent slopes, severely eroded, in Wirt County, in a wooded area, 1 mile southwest of the junction of the Little Kanawha and Hughes Rivers:

Ap—0 to 5 inches, dark-brown (7.5YR 4/2) silty clay loam; moderate, medium, granular structure; friable; many roots; some drift material from decaying surface material; about 10 percent of horizon is fragments of siltstone and sandstone; medium acid; abrupt, wavy boundary; horizon 3 to 6 inches thick.

B1—5 to 8 inches, reddish-brown (5YR 4/4) silty clay loam; weak to moderate, fine, subangular blocky structure; friable; many roots; 10 to 15 percent of horizon is fragments of siltstone and sandstone; strongly acid; clear, wavy boundary; horizon 0 to 4 inches thick.

B21t—8 to 17 inches, yellowish-red (5YR 4/6) silty clay loam; moderate, medium subangular blocky structure; firm when moist, sticky and plastic when wet; roots common; clay coating common on ped faces; 10 to 15 percent of horizon is fragments of siltstone and sandstone; strongly acid; gradual, wavy boundary; horizon 6 to 12 inches thick.

B22t—17 to 33 inches, reddish-brown (2.5YR 4/4) silty clay; moderate, medium, subangular blocky structure; firm when moist, sticky and plastic when wet; few roots; clay coatings common in pores and on ped faces; 25 to 30 percent of horizon is fragments of siltstone and sandstone; medium acid; gradual, wavy boundary; horizon 12 to 20 inches thick.

B3—33 to 43 inches, reddish-brown (2.5YR 4/4) silty clay; weak, fine, subangular blocky structure; firm when moist, sticky and plastic when wet; few roots; 30 to 35 percent of horizon is fragments of siltstone and sandstone; medium acid; clear, wavy boundary; horizon 8 to 15 inches thick.

IIC—43 to 72 inches +, weak-red (10YR 4/3) clay; firm when moist, very sticky and very plastic when wet; 30 to 35 percent of horizon is small fragments of red and olive-brown clay shale; medium acid.

The B horizon ranges from silty clay loam to silty clay. It is most commonly brown in a hue of 2.5YR, but it ranges to brown in a hue of 7.5YR. The browner colors are only in the upper part of the B horizon. The content of sandstone and siltstone fragments varies considerably. In some areas rock fragments make up as much as 30 to 40 percent of the soil mass. Depth to bedrock generally is more than 5 feet.

The Vandalia soils occur with the moderately well drained Muskingum soils and the well drained Upshur soils. Vandalia soils are deeper and finer textured than Muskingum soils and are redder and more limy. They are deeper and coarser textured than Upshur soils. In addition, Vandalia soils are not so sticky and plastic as Upshur soils and contain more fragments of rock.

Figure 9.—**A strongly sloping Vandalia silty clay loam in the narrow band below the wooded area. Nearly level Wheeling soils are in the foreground, and steep soils of an Upshur-Muskingum complex are on the wooded slopes in the background.**

Vandalia silty clay loam, 3 to 10 percent slopes (VaB).—This soil is most common on alluvial fans. Its profile generally contains larger amounts of gravel and rock fragments than the one described as typical for the series. The gravel and rock fragments are near the surface in many places.

This soil generally occurs in small areas and is managed in the same way as soils in adjacent areas. (Capability unit IIe–15)

Vandalia silty clay loam, 10 to 20 percent slopes (VaC).—The profile of this soil is similar to that described as typical for the series, except that it is not so eroded and its plow layer contains more organic matter.

The use of this soil for row crops is limited by a severe hazard of erosion in unprotected areas. (Capability unit IIIe–15)

Vandalia silty clay loam, 10 to 20 percent slopes, severely eroded (VaC3).—This soil has lost part of its original surface layer through erosion. Its present plow layer is low in organic-matter content and is in poor tilth, because it is a mixture of the original surface soil and material from the subsoil. Some small scattered areas are very hummocky and are cut by ravines because of slips and slides.

This soil is better suited to hay and pasture than to row crops. Its use for row crops is limited by the hazard of erosion. The areas of hummocks and ravines should be kept in trees and pasture. (Capability unit IVe–15)

Vandalia silty clay loam, 20 to 30 percent slopes (VaD).—This soil is susceptible to severe erosion in unprotected areas. Its profile is similar to the one described as typical for the series but is not so eroded.

Included with this soil in mapping were a few acres of Vandalia soils that developed on colluvium washed from acid, gray sandstone and shale.

Vandalia silty clay loam, 20 to 30 percent slopes, is better suited to hay and pasture than to row crops. The slope and the hazard of erosion limit use for row crops. (Capability unit IVe–15)

Vandalia silty clay loam, 20 to 30 percent slopes, severely eroded (VaD3).—Erosion has removed most of the orignal surface layer from this steep soil. The present surface layer is a mixture of original surface soil and subsoil material. This layer is low in organic-matter content, poor in tilth, and susceptible to additional erosion. A few slips, gullies, and gall spots occur in some areas. Wet spots caused by seepage are common in some places. The profile of this soil is the one described as typical for the series.

This soil is suited to hay and pasture. (Capability unit VIe–3)

336-400—70——6

Vandalia silty clay loam, 30 to 40 percent slopes (VaE).—Runoff is more rapid on this soil than on Vandalia silty clay loam, 20 to 30 percent slopes, severely eroded. The hazard of erosion is very severe in unprotected areas.

This soil is suited to pasture and trees. Working this soil and managing it for use for hay or row crops is very difficult. (Capability unit VIe-3)

Vandalia silty clay loam, 30 to 40 percent slopes, severely eroded (VaE3).—This soil has lost most of its original surface soil through erosion. A few gall spots, gullies, and slips occur in some areas. Except for the slope, this soil is similar to Vandalia silty clay loam, 20 to 30 percent slopes, severely eroded.

Use of this very steep soil for pasture is limited. Woodland is a better use. (Capability unit VIIe-1)

Vandalia very stony silty clay loam, 20 to 30 percent slopes (VdD).—Included with this soil in mapping were a few acres of Vandalia soils that are gently sloping to strongly sloping and other areas that are severely eroded.

This soil is better suited to pasture and trees than to cultivated crops. Pasture plants grow well throughout the growing season. Although this soil is high in natural fertility, it is too stony for cultivation. (Capability unit VIs-1)

Vandalia very stony silty clay loam, 30 to 40 percent slopes (VdE).—This soil is moderately high in organic-matter content and natural fertility and is moderately susceptible to erosion.

Because this soil is so steep and stony, it is better suited to trees than to pasture. (Capability unit VIIs-1)

Vandalia silty clay, 20 to 30 percent slopes, very severely eroded (VsD4).—Erosion has removed all or almost all of the original surface layer from this soil. Slips, gall spots, and gullies are common. The slips are most prominent.

This soil is better suited to trees than to pasture, though some small areas can be managed for limited use as pasture. (Capability unit VIIe-5)

Wheeling Series

The Wheeling series consists of deep, well-drained soils on terraces along the Ohio River in Wood County. These soils developed mainly in silty material that is underlain by noncalcareous sand or sand and gravel at a depth of 3 to 6 feet. Slopes range from 0 to 20 percent, but slopes of 0 to 5 percent are dominant.

In a typical profile the surface layer is 14 inches thick. It is dark-brown silt loam in the upper 10 inches and yellowish-brown loam or silt loam below. The subsoil extends to a depth of 64 inches. It is dark yellowish-brown to dark-brown silt loam or silty clay loam in the upper part, is light yellowish-brown very fine sandy loam in the middle part, and is dark-brown very gravelly sandy loam in the lower part. The underlying material is dark grayish-brown, loose sand and gravel.

Wheeling soils are moderately permeable and high in natural fertility.

These soils are used for hay and pasture and for crops commonly grown in the two counties. They are good homesites and industrial sites. Much of the acreage in the vicinity of Washington has been used for industrial sites.

Typical profile of Wheeling silt loam, 0 to 3 percent slopes, in Wood County, in a gravel pit at the edge of a hayfield, 2 miles southeast of the Marietta bridge:

Ap—0 to 10 inches, dark-brown (10YR 4/3 to 3/3) light silt loam; weak, medium and fine, granular structure; slightly hard when dry, friable when moist; slightly acid (limed); clear, lower boundary; horizon 7 to 10 inches thick.

A2—10 to 14 inches, yellowish-brown (10YR 5/4) light loam or light silt loam; weak, medium and fine, subangular blocky structure; slightly hard when dry, friable when moist; medium acid to strongly acid; gradual boundary; horizon 3 to 5 inches thick.

B2t—14 to 34 inches, dark yellowish-brown (10YR 4/4) to dark-brown (7.5YR 4/4) heavy silt loam or silty clay loam; moderate, medium and coarse, subangular blocky structure; distinct, dark reddish-brown (5YR 3/3) clay coats on peds; hard when dry, firm when moist; strongly acid; diffuse boundary; horizon 18 to 24 inches thick.

B31—34 to 58 inches, light yellowish-brown (10YR 6/4) very fine sandy loam; some streaks and spots of brown (7.5YR 5/4); few fine, dark reddish-brown (5YR 3/3) clay coats in pores; very weak, coarse and very coarse, subangular blocky structure; firm when moist; peds crush easily; strongly acid; gradual boundary; horizon 18 to 26 inches thick.

B32—58 to 64 inches, dark-brown (7.5YR 4/4) very gravelly sandy loam; very weak, coarse, subangular blocky structure; friable when dry, slightly sticky when wet; distinct clay coatings on sand grains and as bridges between sand grains; strongly acid; diffuse boundary; horizon 2 to 8 inches thick.

IIC—64 to 80 inches, dark grayish-brown, stratified loose sand and gravel derived from sandstone, shale, and quartzite.

The Ap horizon is silt loam in most places but ranges from silt loam to fine sandy loam. In some places the B horizon includes yellowish brown and brown. The B2t horizon ranges from loam to silty clay loam in texture. Depth to sand or sand and gravel is about 3 to 6 feet. In places a few fragments of limestone occur at a depth of 15 to 20 feet.

The Wheeling soils occur with the excessively drained Lakin soils, the moderately well drained Sciotoville soils, and the poorly drained Ginat soils. Wheeling soils are finer textured than Lakin soils, and they have better internal drainage than Sciotoville and Ginat soils.

Wheeling fine sandy loam, 0 to 3 percent slopes (WeA).—The profile of this soil is coarser textured than that described as typical for the series. This soil is more droughty in summer than Wheeling silt loam, 0 to 3 percent slopes, but otherwise it is similar to that soil.

Included with this soil in mapping were a few acres of gravelly sandy loam. These areas are shown on the detailed soil map by gravel symbols.

This soil is suited to crops and to hay and pasture. Row crops can be grown every year if management is good. (Capability unit IIs-2)

Wheeling fine sandy loam, 3 to 10 percent slopes (WeB).—This soil generally occurs in ridgelike areas. Except for its coarser texture, the profile of this soil is similar to that described as typical for the series.

Included with this soil in mapping were a few acres of gravelly sandy loam.

This soil is suited to most of the crops commonly grown in the two counties. (Capability unit IIs-2)

Wheeling fine sandy loam, 10 to 20 percent slopes (WeC).—This soil occurs mainly along breaks between terraces and bottom lands. Its profile is coarser textured than that described as typical for the series and is shallower to sand and gravel.

Included with this soil in mapping were a few acres having slopes of more than 20 percent.

This soil is suited to cultivated crops and to hay and pasture. (Capability unit IIIe-4)

Wheeling silt loam, 0 to 3 percent slopes (WhA).—This soil is not more than slightly eroded. It has the profile described as typical for the series.

This soil can be row cropped every year. Also, it is well suited to truck crops and to alfalfa. (Capability unit I-4)

Wheeling silt loam, 3 to 10 percent slopes (WhB).—This soil commonly occurs in low, ridgelike areas. Its profile is slightly shallower to sand and gravel than that described as typical for the series. The hazard of erosion is moderate in unprotected areas.

The hazard of erosion limits the use of this soil for row crops. (Capability unit IIe-4)

Wheeling silt loam, 10 to 20 percent slopes (WhC).—This soil occurs mainly along breaks between the terraces. Its profile is shallower to sand and gravel than that described as typical for the series. The hazard of erosion is severe in unprotected areas.

Included with this soil in mapping were a few acres having slopes of more than 20 percent.

This soil is limited in its use for row crops because of the severe hazard of erosion. (Capability unit IIIe-4)

Zoar Series

The Zoar series consists of deep, moderately well drained soils on terraces. These soils developed in acid silt and clay deposited by slack water. They occur mainly near the Wood County Airport in Wood County and near Palestine and Center Hill in Wirt County. Slopes range from 3 to 30 percent, but slopes of 6 to 15 percent are dominant.

In a typical profile the surface layer is silt loam 15 inches thick. It is dark brown in the upper part and yellowish brown in the lower part. The subsoil extends to a depth of 30 inches. It is strong-brown silty clay loam in the upper part and is strong-brown silty clay in the lower part. It is mottled with brown to grayish brown between depths of 20 and 30 inches. The underlying material is reddish-brown clay distinctly mottled with strong brown.

Zoar soils are slowly permeable, and they are waterlogged from late in fall to late in spring. Natural fertility is low. The hazard of erosion is severe.

These soils are used for hay and pasture and most of the crops commonly grown in the two counties. Alfalfa and other deep-rooted legumes may not last long. Several acres near the Wood County Airport are wooded; the trees are mainly Virginia pine. Because Zoar soils occur in areas of intensive housing development, it is advisable to consider the slow permeability when planning the sewage system to be used.

Typical profile of Zoar silt loam, 3 to 10 percent slopes, in Wood County, at edge of idle field at the intersection of State Routes 2 and 31:

Ap—0 to 7 inches, dark-brown (10YR 4/3) silt loam; moderate, fine, granular structure; very friable; many fine roots; strongly acid; clear, smooth boundary; horizon 5 to 8 inches thick.

A2—7 to 15 inches, yellowish-brown (10YR 5/4) silt loam; weak, thin, platy structure; very friable; many fine roots; worm borrows common; strongly acid; gradual, wavy boundary; horizon 5 to 9 inches thick.

B1—15 to 20 inches, strong-brown (7.5YR 5/6) light silty clay loam; moderate, medium, granular structure; friable when moist, nonplastic and nonsticky when wet; few fine roots; discontinuous clay coats; worm burrows filled with soil material; strongly acid; clear, wavy boundary; horizon 3 to 6 inches thick.

B2t—20 to 30 inches, strong-brown (7.5YR 5/6) silty clay; few brown to grayish-brown (10YR 5/3-5/2) mottles that are grayer in lower part of horizon; strong, medium, subangular blocky structure; firm roots; few fine pores; continuous clay coats; numerous iron concretions that range from the size of a pin head to the size of a pea; strongly acid; gradual boundary; horizon 8 to 12 inches thick.

IIC—30 to 39 inches +, reddish-brown (5YR 5/3) clay; interior of peds is reddish brown (2.5YR 4/4); many, coarse, distinct mottles of strong brown (7.5YR 5/6); massive; firm when moist, plastic and sticky when wet; few roots; strongly acid.

The texture of the Ap horizon is silt loam or silty clay loam. The texture of the B horizon ranges from silty clay loam to clay, and the color generally is yellowish brown, strong brown, or yellowish red in hues of 10YR, 7.5YR, and 5YR. Depth to mottling ranges from 18 to 30 inches. The underlying material is alkaline in some places.

Because of the reddish hues, gray mottles are lacking or are less distinct in the Zoar soils that occur in Wood and Wirt Counties than is typical for the Zoar soils throughout the country. In addition, the thickness of the solum over nonconforming material is less than is typical in other places.

The Zoar soils occur with the moderately well drained Monongahela soils and the somewhat poorly drained to poorly drained Tygart soils. Zoar soils are finer textured in the subsoil than Monongahela soils, and they have better internal drainage than Tygart soils.

Zoar silt loam, 3 to 10 percent slopes (ZoB).—This soil is mottled at a depth of 18 to 20 inches. The hazard of erosion is moderate in unprotected areas. This soil has the profile described as typical for the series.

Included with this soil in mapping were a few acres that are severely eroded.

This soil is suited to the crops commonly grown in the two counties, but use for row crops and deep-rooted legumes is limited. (Capability unit IIe-13)

Zoar silt loam, 10 to 20 percent slopes (ZoC).—This soil commonly occurs on slopes above drainageways. Depth to mottling generally is more than 18 to 20 inches. The hazard of erosion is severe in unprotected areas.

This soil is suited to most of the crops commonly grown in the two counties. Runoff and the hazard of erosion prevent use for row crops every year. (Capability unit IIIe-13)

Zoar silty clay loam, 10 to 20 percent slopes, severely eroded (ZsC3).—This soil has lost most of its original surface layer through erosion. Its present surface layer is a mixture of the original surface soil and material from the subsoil. This layer contains less organic matter and is in poorer tilth than the surface layer of Zoar silt loam, 3 to 10 percent slopes. Gall spots occur in a few places and the subsoil is exposed.

Included with this soil in mapping were a few acres that are very severely eroded.

Although a row crop can be grown occasionally, this soil is better suited to hay and pasture. (Capability unit IVe–9)

Zoar silty clay loam, 20 to 30 percent slopes, severely eroded (ZsD3).—This soil occurs in dissected areas. Erosion has removed most of its original surface soil, and the present surface layer is a mixture of the original surface soil and material from the subsoil. Gall spots are common, and the subsoil is exposed in some areas. The present surface layer of this soil is finer textured than that of Zoar silt loam, 3 to 10 percent slopes, and it absorbs water more slowly and has more rapid runoff.

Included with this soil in mapping were a few small areas that are very severely eroded.

This soil is suited to hay and pasture, but the small, very severely eroded areas are better suited to trees. (Capability unit VIe–2)

Formation and Classification of Soils

In this section, the major factors of soil formation are discussed in terms of their effect on the development of the soils in Wood and Wirt Counties. The current system of soil classification is briefly described, and the soils in the two counties are placed in some classes of that system and in great soil groups of an older system. The soil series in the two counties, including a profile typical for the series, are described in the section "Descriptions of the Soils."

Factors of Soil Formation

Soil is produced by the interaction of the major factors of soil formation. These factors are parent material, time, climate, plant and animal life, and relief (*3*). They control or influence the soil-forming processes of additions, losses, transfers, and alterations and determine whether or not a horizon is faint or distinct. The kind of soil formed in one area differs from the kind formed in another area if there has been a difference between the two areas in parent material, climate, or any other factor. Parent material, relief, and time account for most of the differences among the soils in Wood and Wirt Counties. Because the climate and plant and animal life were relatively uniform throughout these two counties, each factor has had about the same influences on all the soils.

Parent material, time, and geologic influences

Parent material, time, and geology are discussed together in this section because of their interrelated effect on the formation of soils. The length of time that parent material has been in place and exposed to climatic, biological, chemical, and mechanical influences is reflected in the distinctive characteristics of each soil profile.

Parent material, the unconsolidated mass from which soil forms, has much to do with the chemical and mineralogical composition of the soil. The soils of Wood and Wirt Counties formed in residuum, alluvium, colluvium, and loess, or material deposited by the wind.

Many of the soils that developed in residuum strongly reflect characteristics of the parent rock. Soils of the Upshur-Brooke and the Upshur-Muskingum complexes occupy most of the uplands in Wood and Wirt Counties. These soils formed in place over thick beds of limy, red shale; thin beds of acid, gray shale, siltstone, and sandstone; and thin beds of impure limestone of the Dunkard geologic series, which is of Carboniferous Age. The strata are nearly horizontal. The Upshur and Brooke soils have a moderately developed profile and a high content of clay. They are reddish brown, are plastic, and have a relatively high content of lime. These soils erode easily, have slow to very slow permeability and, in steep areas, are subject to sliding and slipping. The Muskingum soils are yellowish brown, medium textured, and acid, and they have a weakly developed profile.

In the eastern part of both counties, the Muskingum and Tilsit soils developed in older residuum from thick beds of acid, gray sandstone, siltstone, and shale that are thinly interbedded with coal, limestone, and red shale of the Monongahela, Conemaugh, and Allegheny formations. These formations are exposed in the Burning Springs (Volcano) Anticline. The Muskingum and Tilsit soils are silty or sandy, yellowish brown, and acid, and they have a weakly developed profile.

In terms of years, soils that have strongly developed profiles are usually considered to be the oldest. The steep soils on uplands, however, have profiles that are less developed than those of younger, nearly level soils on the higher alluvial terraces. This lack of a distinct profile results from severe erosion and mixing of parent materials as they move down the slopes. Abrupt climatic changes, plant growth, man and animal activity, ground water, and gravity have contributed strongly to the formation and characteristics of these residual soils.

Soils on bottom lands and the older higher terraces formed in materials carried and laid down by moving waters. The youngest of the alluvial materials are the deposits on the low bottoms, or flood plains. These deposits have washed down from the lime-influenced and acid materials in the uplands. Because of frequent overflow, the Huntington, Lindside, Moshannon, and Senecaville soils, in many places, contain thin layers and lenses of sand and gravel. Their profiles show only weak to moderate soil structure, no distinct horizons, and a slight difference in color beneath the surface layer. Soil development has been limited by the short time since the alluvium was deposited.

The Ashton and Hackers soils developed in alluvium on high bottoms that are flooded infrequently. These soils formed in older material than have the soils on low bottoms, but this material has an origin similar to that of the material on low bottoms. The Ashton and Hackers soils have a relatively weak, but distinctly layered, profile that shows definite clay accumulation in the subsoil. In many places the parent material contains lenses of sand and fine gravel.

The oldest and highest alluvial terraces in the two counties contain material derived from local sandstone and siltstone. This material probably was washed in and laid down during the Kansan glacial period. The deposits probably blanketed the landscape, but in the steeper areas erosion has removed much of the material. The Allen, Monongahela, and Zoar soils occupy these high terraces. These soils have been in place long enough for a moderately to strongly developed profile to form. Each layer in these soils has distinct properties that can be identified easily over broad areas. The soil-forming processes have been active for a considerable period.

During the Illinoian glacial period, the Ohio River drainage system was blocked in the vicinity of Cincinnati, Ohio, and slack water again covered the valleys of the Little Kanawha River and its tributaries. Thick deposits of grayish-brown and brownish-gray, thinly layered, calcareous silt and clay accumulated in these areas. Remnants of these deposits now occupy the broad, nearly level areas in old meanders of the Little Kanawha River near Parkersburg, Pettyville, Mineralwells, Leachtown, and Newark. Small areas occur also near the mouth of Pond Creek and Lee Creek. The Markland and McGary soils on these terraces have a weakly to moderately developed profile. On these soils, a seasonal high water table and slow permeability have slowed the soil-forming processes.

The youngest alluvial terraces occur along the Ohio River Valley in the vicinity of Williamstown, Vienna, and Parkersburg, and below Washington. These terraces contain silt, sand, and gravel of Wisconsin age that were transported by glacial melt water. The coarse fragments include Canadian granite, gabbro, gneiss, and quartzite. The Wheeling, Sciotoville, and Ginat soils that formed on these terraces have a weakly to moderately developed profile. The Cotaco soils formed in alluvium on terraces along the Little Kanawha River are very similar except for coarse soil particles from local sandstone and siltstone.

Colluvial materials are along the foot slopes and around the head of streams throughout Wood and Wirt Counties. This material has drifted downslope from the uplands, mainly from Upshur and Muskingum soils that formed on limy, red clay shale, and acid, gray shale, siltstone, and sandstone. Most of the soils that developed on colluvial material are strongly influenced by the limy, red clay shale, and they contain moderate to high amounts of carbonates and are clayey and slowly permeable. These soils have a moderately developed profile. Soils that developed in colluvium are in the Vandalia series.

Wind-deposited sand and silt occur along the Ohio River. Sandy dunelike areas are near the Wheeling soils, and a mantle of silt covers the hills facing the river and the hilltops nearby. This material probably was blown from the terraces and bottom lands along the Ohio River following the formation of the Wheeling terraces. Lakin soils occupy the dunelike slopes and are deep, very rapidly permeable, sandy soils that have a very weakly developed profile. Duncannon soils developed on the silty deposits on the hills and have a moderately developed profile.

Climate

The climate of Wood and Wirt Counties is warm and humid. Although the Ohio River has a warming effect in areas along the river, the climate is generally uniform throughout the two counties. It is, therefore, not responsible for any major differences in the soils.

Climate acting with other soil-forming factors, however, is important in producing many of the characteristics found in the soils of the two counties. The climate has been favorable for the forming of horizons in the soil profile. The extensive soils in these counties are low in organic-matter content, are fairly well leached of bases in the upper part of their solum, and have a moderately developed profile. Climatic data for the two counties are given in the section "General Nature of the Area."

Plant and animal life

Plants, micro-organisms, earthworms, and other forms of life that live on or in the soil are active in the soil-forming processes. These forms of life supply organic matter to the soils and transfer plant nutrients and soil material from one horizon to another (*11*).

A hardwood forest that consisted of oak, hickory, ash, walnut, and yellow-poplar covered most of Wood and Wirt Counties; sycamore and elm commonly grew on the bottom lands and on the terraces along streams. The soils formed under this forest vegetation have thin horizons of accumulated organic matter and were subject to leaching. Small animals acted on the plant remains and helped to convert them into organic matter. Unless limed, most of the soils in the two counties are acid in their surface layer.

Relief

In Wood and Wirt Counties, relief affects soil formation through its effect on the amount of water that passes through the soil, the degree of runoff, and erosion.

Nearly level and gently sloping soils on old terraces and residual materials have had large amounts of water move through them. Lesser amounts were lost through runoff. This condition is favorable for the formation of deep soils that have well-developed profiles, such as the Allen, Monongahela, and Tilsit.

Relief is favorable for the formation of soils on the bottom lands and young terraces, and it is progressing at a fairly rapid rate. Soils that formed on these materials are weakly developed, however, mainly because so little time has elapsed since the materials were deposited.

On some of the materials deposited by slack water on terraces, slopes are nearly level and most of the water they receive must pass through these materials. This water, however, passes so slowly through these clayey materials that they are waterlogged late in fall, in winter, and early in spring. Because of this, conditions are less favorable for distinct horizons to develop in the soil profile. The McGary soil is common on these materials.

On the steep hillsides, soil material is washed away almost as fast as it is formed. Upshur soils and Muskingum soils are extensive in the two counties and commonly occur as moderately steep and steep soils in complexes. It is likely that these soils will remain shallower to bedrock than soils on more gentle slopes.

Classification of Soils

In classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and used in managing farms, fields, and woodland; in engineering work; in developing recreational, industrial, and residential areas; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*3*) and later revised (*9*). The current system was adopted for general use by the National Cooperative Soil Survey in 1965. Because this system is under continual study, readers interested in latest developments of this system should search the latest literature (*8*, *12*). In table 9, the soil series of Wood and Wirt Counties are placed in some categories of the current system and in the great soil groups of the older 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, soil properties that are observable and measurable are used as a basis for classification. These properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped together. The classes of the current system are briefly defined in the following paragraphs.

ORDER: Ten soil orders are recognized in the current system. They 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 are the Entisols and Histosols, which occur in many different climates. Five of the soil orders are represented in Wood and Wirt Counties. They are Entisols, Inceptisols, Mollisols, Alfisols, and Ultisols.

Entisols are recent mineral soils that do not have genetic diagnostic horizons or have only the beginnings of such horizons. These soils have changed little from the geologic parent material in which they are developing. The Lakin soils are the only Entisols in Wood and Wirt Counties.

Inceptisols are mineral soils that have genetic horizons starting to develop but do not have horizons of clay accumulation. The Lindside, Melvin, Moshannon, Muskingum, and Senecaville soils are the Inceptisols in the two counties.

TABLE 9.—*Soil series classified according to current system of classification* [1] *and the 1938 system with its later revisions*

Series	Current classification			1938 classification with later revisions
	Family	Subgroup	Order	Great soil group
Allen	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Ashton	Fine-silty, mixed, mesic	Mollic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading to Alluvial soils.
Brooke	Fine, mixed, mesic	Mollic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Cotaco	Fine-loamy, mixed, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading to Alluvial soils.
Duncannon	Coarse-silty, mixed, mesic	Ultic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading to Red-Yellow Podzolic soils.
Ginat	Fine-silty, mixed, mesic	Typic Fragiaqualfs	Alfisols	Low-Humic Gley soils.
Hackers	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading to Alluvial soils.
Huntington	Fine-silty, mixed, mesic	Fluventic Hapludolls	Mollisols	Alluvial soils.
Lakin	Sandy, siliceous, acid, mesic	Alfic Udipsamments	Entisols	Regosols intergrading to Gray-Brown Podzolic soils.
Lindside	Fine-silty, mixed, mesic	Aquic Fluventic Eutrochrepts.	Inceptisols	Alluvial soils.
Markland	Fine, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
McGary	Fine, mixed, mesic	Typic Ochraqualfs	Alfisols	Gray-Brown Podzolic soils intergrading to Low-Humic Gley soils.
Melvin	Fine-silty, mixed, nonacid, mesic.	Fluventic Haplaquepts	Inceptisols	Low-Humic Gley soils.
Monongahela	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols	Red-Yellow Podzolic soils.
Moshannon	Fine-loamy, mixed, mesic	Dystric Fluventic Eutrochrepts.	Inceptisols	Alluvial soils.
Muskingum	Fine-loamy, mixed, mesic	Typic Dystrochrepts	Inceptisols	Sol Bruns Acides intergrading to Lithosols.
Sciotoville	Fine-loamy, mixed, mesic	Aquic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils intergrading to Red-Yellow Podzolic soils.
Senecaville	Fine-loamy, mixed, mesic	Aquic Fluventic Eutrochrepts.	Inceptisols	Alluvial soils.
Tilsit	Fine-silty, mixed, mesic	Typic Fragiudults	Ultisols	Red-Yellow Podzolic soils.
Tygart	Clayey, mixed, mesic	Aquic Hapludults	Ultisols	Red-Yellow Podzolic soils intergrading to Low-Humic Gley soils.
Upshur	Fine, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Vandalia	Fine, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Wheeling	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading to Red-Yellow Podzolic soils.
Zoar	Clayey, mixed, mesic	Aquic Hapludults	Ultisols	Red-Yellow Podzolic soils.

[1] Placement of some series in the current system of classification, particularly in families and subgroups, may change as more precise information becomes available.

Mollisols are mineral soils that have a thick dark-colored surface layer that has high base saturation. They may or may not have horizons of clay accumulation. The Huntington soils are the only Mollisols in the two counties. They do not have a B horizon of clay accumulation. Because they formed in fairly recent alluvium, the organic matter occurs erratically through their subsurface horizons.

Alfisols are mineral soils that have a B horizon of clay accumulation and a high base saturation. The Alfisols in the two counties are the Ashton, Brooke, Duncannon, Ginat, Hackers, Markland, McGary, Sciotoville, Upshur, Vandalia, and Wheeling soils.

Ultisols have the most strongly developed horizons of any soil in Wood and Wirt Counties. Ultisols are mineral soils that have a B horizon of clay accumulation and a relatively low base saturation. The Ultisols in the two counties are the Allen, Cotaco, Monongahela, Tilsit, Tygart, and Zoar soils.

SUBORDER: Each order is divided into suborders, primarily on the basis of those soil characteristics that produce classes having the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging or soil differences resulting from the climate or vegetation.

GREAT GROUP: Suborders are separated into great groups according to the presence or absence of genetic horizons and the arrangement of these horizons. The horizons used to make separations are those in which clay, iron, or humus has accumulated or those that have pans that interfere with the growth of roots or the movement of water. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like. The great group is not shown separately in table 9, because it is the last word in the name of the subgroup.

SUBGROUP: Great groups are subdivided into subgroups, one representing the central, or typic, segment of a group, and others, called intergrades, that have 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 of the range of any other great group, suborder, or order.

FAMILY: Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or to the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name.

General Nature of the Area

This section provides general information about Wood and Wirt Counties. It discusses the settlement and early development, farming, transportation and industry, relief and drainage, and climate of the two counties. The figures for population and the statistics on agriculture are from reports of the U.S. Bureau of Census.

Settlement and Population

Settlement of the area that is now Wood and Wirt Counties began about 1800. The early settlers lived mostly by hunting, fishing, and lumbering (*16*). They settled in the area near the present towns of Parkersburg, Wood County, and Elizabeth, Wirt County. These early settlers cleared small patches of land to grow wheat and corn for home use, and they raised a few cattle. Supplies, which were traded for furs, were brought by boat from Pittsburgh, Pa., and by wagon from Virginia.

The building of a turnpike from Parkersburg to Staunton, Va., in 1843 helped the development of agriculture in the area, especially the raising of cattle. The oil and gas industries influenced the development of Wood and Wirt Counties. In the mid 1800's, the oil boom at Burning Springs and Volcano created many new jobs, which slowed the development of agriculture. After a system of locks was built on the Kanawha River, oil was transported to markets in Parkersburg, Wood County, and to Marietta, Ohio.

The population of Wood County was 78,331 in 1960. Parkersburg, the county seat, has a population of 44,797. The population of Wirt County was 4,391 in 1960, and that of Elizabeth, the county seat, was 727.

Farming

According to the United States Census of Agriculture, Wood County had 870 farms totaling 93,995 acres in 1964 and Wirt County had 331 farms totaling 51,878 acres. In 1964 the average size of farms was 156.7 acres in Wood County and 134.4 acres in Wirt County.

In both counties most farms are of the general type. The raising of beef cattle is the most common farming enterprise in both counties. Dairying is important in the vicinity of Parkersburg, Wood County. Off-farm employment is also common in these counties, and in 1964 slightly more than half of the farmers reported they worked off their farms.

On most farms corn is grown on the narrow flood plains, pasture on the adjacent, mostly steep hillsides, and hay on the ridgetops and benches. A mixture of clover and grass is commonly grown for hay.

The acreage of corn grown for grain, of wheat and oats harvested, and of all hay crops in both counties for 1959 and 1964 is shown in table 10.

The present trend in land use in the two counties is from cropland to pasture. From 1959 to 1961, in Wood County, cropland decreased from 37,726 to 25,027 acres and pasture increased from 48,767 to 49,549 acres. During the same period in Wirt County, cropland decreased from 15,786 to 10,627 acres and pasture increased from 21,181 to 37,662 acres. Also, many farms on unimproved roads and many steep areas that were once used for crops or pasture are reverting to woodland.

TABLE 10.—*Acreage of specified crops in Wood and Wirt Counties in 1959 and 1964*

Crop	Wood County		Wirt County	
	1959	1964	1959	1964
	Acres	*Acres*	*Acres*	*Acres*
Corn (for grain)	2, 411	1, 850	882	401
Wheat (harvested)	288	264	5	5
Oats (harvested)	247	84	6	29
Hay crops (total)	15, 478	12, 749	9, 284	6, 546

Transportation and Industry

Wood and Wirt Counties are served by a network of Federal, State, and county roads. U.S. Highway No. 21 enters the northern part of Wood County and runs roughly southward through the county. A few miles of this highway cross the western edge of Wirt County. Interstate Highway No. 77 enters Wood County at Williamstown and generally parallels U.S. Highway No. 21. U.S. Highway No. 50 runs through Parkersburg as it crosses the northern part of Wood County. Heavily travelled in the two counties are State Routes 2, 5, 14, 31, 47, and 53. Many other roads are along the narrow valleys and ridgetops.

Wood County has an airport. The Baltimore and Ohio Railroad connects Parkersburg with Washington, D.C. and to the west, with St. Louis, Mo. Freight trains transport goods from Parkersburg to Pittsburgh, Pa., and to Huntington, W. Va. Barges on the Ohio River carry a large amount of goods.

The Parkersburg area is the most industrialized part of the two counties. The valley of the Ohio River is well situated for industrial expansion. It is served by a good transportation system. The Ohio River, besides serving as a means of barge transport, furnishes a good supply of water for industrial use. In recent years new plants have located in the valley, and some of the older plants have expanded. The employment provided by these plants has lessened the intensity of farming in the two counties.

Some of the goods that are manufactured are glass and plastic products, tool handles, drilling equipment, porcelain, small steel products, and rayon and other chemical products. Most of the old established oil and gas fields are still producing, and new wells are drilled in some areas. The opening of a pulpwood buying yard at Walker, in Wood County, enables farmers to add to their income by selling pulpwood.

Relief and Drainage

Wood and Wirt Counties are part of a highly dissected plateau that is characterized by ridges and steep hillsides. The hillsides are broken by a system of benches. Except for their high knobs and saddles, the ridgetops are fairly uniform in elevation. A knob 2½ miles northeast of Burning Springs, in Wirt County, is the highest point (1,325 feet) above sea level. The lowest point (565 feet) is on the Ohio River south of Belleville, in Wood County. The streams in the two counties flow in V-shaped valleys that are generally narrow but that widen along the Little Kanawha and Ohio Rivers. Terraces occur along the larger streams and indicate the various positions of the streams many years ago.

Most of the streams in the two counties drain into the Little Kanawha River, which flows through the center of the area and empties into the Ohio River at Parkersburg. Some of the streams in Wood County flow directly into the Ohio River as do Pond and Lee Creeks south of Parkersburg and Bull Creek and Big Run to the north.

The elevation of the Little Kanawha River is about 630 feet at the Wirt-Calhoun County line and is about 572 feet at its junction with the Ohio River at Parkersburg.

Climate[4]

The climate of Wood and Wirt Counties is humid and continental. The two counties are exposed to invasions of cold, dry air from the north and masses of moist air from the Gulf of Mexico. In addition, an area in the immediate vicinity of the Ohio River, in Wood County, about 5 miles wide, receives warm air from the Ohio River in winter. Large storms, mostly in the coldest part of the year, move northeastward up the Ohio River Valley and affect the climate of the area. Generally, the temperature varies widely during the year, and changes from fair to stormy weather are frequent. Alternate freezing and thawing are common in winter.

Data on temperature and precipitation for Wood and Wirt Counties are given in tables 11 and 12. Data on snow cover are not given for Parkersburg in table 11, but at Parkersburg snow cover is only slightly less than that at Creston, which is given in table 12. The probabilities of the last freezing temperatures in spring and the first in fall are given in table 13. The data given in table 11 are from records kept at Parkersburg, which is at an elevation of 615 feet. This data applies only to the area in Wood County that is in the immediate vicinity of the Ohio River. The data given in table 12 are from records kept at Creston, which is in Wirt County at an elevation of 640 feet. These figures apply to Wirt County as a whole and also to that part of Wood County that is not within 5 miles of the Ohio River; they are more representative of the temperature and precipitation in both counties, if the differences in elevation and corresponding differences in slope are considered.

Winters are generally moderate in the two counties. Each year two or three periods of cold weather occur, but a cold wave ordinarily lasts for only a few days. In January, the average maximum temperature ranges from 42° in the northern part of Wood County to 46° in the extreme southern parts of both counties. Average minimum temperature is between 22° and 28°. An extremely low temperature of -3° can be expected once every 2 years, of -16° once every 10 years, and of -22° once every 25 years; these readings were based on data obtained from Creston, in Wirt County. Temperatures of 90° or higher normally occur on an average of 23 days per year. For both counties, the average maximum temperature for July is between 80° and 90°, and the average minimum

[4] By ROBERT O. WEEDFALL, State climatologist, U.S. Weather Bureau.

TABLE 11.—*Temperature and precipitation data*

[Data from records kept at Parkersburg, Wood County, for period 1931–60]

Month	Temperature				Precipitation		
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—		Average monthly total	One year in 10 will have—	
			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*
January	43	26	63	6	3. 3	1. 4	6. 2
February	45	27	64	8	2. 8	1. 3	4. 9
March	53	33	74	17	3. 5	1. 4	5. 7
April	65	43	84	30	3. 3	1. 7	5. 2
May	75	53	89	39	3. 7	1. 7	5. 7
June	83	62	93	51	4. 3	2. 4	6. 3
July	86	65	96	56	4. 1	1. 8	6. 9
August	85	64	94	53	3. 8	1. 3	7. 0
September	79	57	92	43	2. 7	1. 0	4. 8
October	68	46	85	32	2. 1	. 7	3. 6
November	54	35	73	22	2. 4	1. 1	4. 3
December	44	28	65	10	2. 8	1. 2	4. 7
Year	65	45	[1] 97	[2] 2	38. 8	30. 5	48. 7

[1] Average annual highest temperature.

Average annual lowest temperature.

TABLE 12.—*Temperature and precipitation data*

[Data from records kept at Creston, Wirt County, for period 1931–60]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—		Average monthly total	One year in 10 will have—		Days with snow cover of 1.0 inch or more	Average depth of snow on days with snow cover
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—		
	°*F.*	°*F.*	°*F.*	°*F.*	*Inches*	*Inches*	*Inches*	*Number*	*Inches*
January	45	23	66	2	4. 0	1. 8	6. 5	7	3. 0
February	47	23	66	3	3. 2	1. 2	5. 5	5	3. 4
March	55	29	75	13	4. 2	2. 0	6. 4	3	2. 8
April	67	38	85	25	3. 5	1. 5	5. 3	0	0
May	77	48	90	34	4. 1	1. 9	6. 5	0	0
June	85	57	94	46	4. 7	2. 4	8. 0	0	0
July	88	61	97	51	4. 4	2. 1	7. 2	0	0
August	87	60	96	49	4. 3	1. 9	7. 0	0	0
September	82	52	94	38	3. 0	1. 1	5. 4	0	0
October	71	41	87	27	2. 6	. 8	5. 1	0	0
November	56	30	74	17	3. 0	1. 3	5. 8	1	[1] 2. 3
December	46	24	65	3	3. 4	1. 4	6. 1	5	2. 9
Year	67	41	[2] 98	[3] −3	44. 2	34. 5	54. 0	21	----------

[1] Storm of November 1950 not included in data.

[2] Average annual highest temperature.

[3] Average annual lowest temperature.

TABLE 13.—*Probabilities of last freezing temperatures in spring and first in fall*

[Data from records kept at Parkersburg apply only to an area about 5 miles wide that is in the vicinity of the Ohio River in Wood County; data from records kept at Creston apply to all of Wirt County and to that part of Wood County that is not within 5 miles of the Ohio River]

Location and probability	Dates for given probability at temperature of—		
	16° or lower	24° or lower	32° or lower
Spring:			
Parkersburg (*5*):			
1 year in 10 later than	March 21	April 7	May 1
1 year in 4 later than	March 11	March 28	April 24
1 year in 3 later than	March 7	March 24	April 21
2 years in 3 later than	February 20	March 10	April 12
3 years in 4 later than	February 16	February 25	April 9
9 years in 10 later than	February 6	February 25	April 2
Creston:			
1 year in 10 later than	March 28	April 23	May 17
1 year in 4 later than	March 20	April 16	May 8
1 year in 3 later than	March 16	April 13	May 6
2 years in 3 later than	March 4	April 2	April 28
3 years in 4 later than	March 1	March 30	April 26
9 years in 10 later than	February 21	March 22	April 17
Fall:			
Parkersburg (*5*):			
1 year in 10 earlier than	November 24	November 6	October 7
1 year in 4 earlier than	November 30	November 13	October 14
1 year in 3 earlier than	December 3	November 16	October 17
2 years in 3 earlier than	December 12	November 26	October 26
3 years in 4 earlier than	December 15	November 29	October 29
9 years in 10 earlier than	December 22	December 6	November 4
Creston:			
1 year in 10 earlier than	October 30	October 17	September 29
1 year in 4 earlier than	November 12	October 25	October 5
1 year in 3 earlier than	November 17	October 28	October 7
2 years in 3 earlier than	December 6	November 8	October 14
3 years in 4 earlier than	December 11	November 11	October 16
9 years in 10 earlier than	December 24	November 18	October 22

temperature ranges from 60° to 66°. In spring and in fall the average temperature is about 50°.

The average frost-free period is 188 days at Parkersburg, Wood County, and is 162 days at Creston, Wirt County. The average date of the last freezing temperature in spring is April 16 at Parkersburg and May 2 at Creston. The average date of the first freezing temperature is October 21 at Parkersburg and October 11 at Creston.

During the growing season (May through September) rainfall averages 18.57 inches at Parkersburg and 20.44 inches at Creston. At the beginning of the growing season the moisture in the soil ranges from adequate to excessive. The amount of rainfall in the growing season is generally enough for most crops. Crops are damaged about once every 4 or 6 years during dry weather that generally occurs in July or August. Frequent rains late in May or in June may delay the harvesting of hay. Rainfall generally is heaviest during June, July, and August and is lightest in September, October, and November.

The annual snowfall averages about 25 inches in the two counties, but it ranges from less than 4 inches to more than 55 inches. Snowfall generally is slightly less at Parkersburg than in the other parts of Wood County and in Wirt County; it is slightly more in areas at higher elevations than in other parts of Wood and Wirt Counties. In the vicinity of Parkersburg, rainfall is heavier than snowfall.

Areas along the Little Kanawha and Ohio Rivers are likely to be flooded in winter and early in spring, particularly if the melting snow is accompanied by heavy rainfall. Heavy rains that generally occur late in the afternoon produce flash floods along the tributaries of the Little Kanawha and Ohio Rivers.

No records of evaporation have been kept in the two counties, but an analysis of data from places nearby suggests that the average evaporation from a Class A 4-foot pan would amount to about 43 inches a year at Creston and to about 45 inches a year at Parkersburg. During the growing season (May through September) evaporation is about 32 inches at Creston and about 33 inches at Parkersburg. Evaporation from ponds and reservoirs should be about 75 percent of this amount.

In the two counties the prevailing winds are from the southwest. Wind velocity is less than 5 miles per hour a third of the time, but it averages about 8 miles per hour in spring and about 5 miles per hour in summer. Winds that blow at a rate of more than 40 miles per hour occasionally accompany large storms or, in summer, severe thunderstorms. These strong winds cause minor damage in some areas.

An average of 45 thunderstorms occur in any one place, about 40 percent of them occurring in June and July. In some of the more intense storms wind and hail cause some local damage. Only four tornadoes passed over Wood and Wirt Counties between 1875 and 1965.

Generally, the relative humidity is lower in summer than in winter. At Parkersburg the average relative humidity at night and early in morning is about 80 percent, but it ranges from 75 percent in spring to about 84 percent late in summer and in fall. The high humidity in summer and fall occurs at night and during the early morning, and it is the result of fog in the river bottom lands and in the lower valleys. The relative humidity ranges from 50 to 60 percent at midday all the year, but it is much lower than this from sunrise to noon. In summer hot, muggy weather that lasts as long as 2 weeks or more occurs only occasionally.

In an average year, there are 109 clear days, 103 partly cloudy days, and 153 cloudy days in the two counties. Cloudy days are most numerous in winter. In the period June through September, which is the season of most sunshine, about 60 percent of the days are sunny, and in December through January about 30 percent of the days are sunny. The fog, particularly in the valleys, also reduces the number of sunny hours. On clear days the cloud cover is 0 to 30 percent, and on cloudy days it is more than 80 percent.

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Glossary

Acidity, soil. See Reaction, soil.

Aggregate, soil. Many fine particles held in a single mass or cluster, such as a clod, crumb, block, or prism.

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

Available moisture capacity. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in a soil between field capacity and the amount in the same soil at permanent wilting point. Commonly expressed as inches of water per inch depth of soil.

Bedding, land. Plowing, grading, or otherwise elevating the surface of a flat field into a series of broad beds, or "lands," so as to leave shallow surface drains between the beds.

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

Calcareous soil. A soil that contains enough lime or calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. It is alkaline in reaction because calcium carbonate is present.

Channery soil. A soil that contains thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches in length along the longer axis. A single piece is called a fragment.

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

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clean tillage. Cultivation to prevent the growth of all vegetation except the particular crop desired.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; soil does not hold together in a mass.

Friable.—When moist, soil crushes easily under gentle to moderate pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, soil crushes easily under moderate pressure between thumb and forefinger but resistance is distinctly noticeable.

Plastic.—When wet, soil is 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, soil adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, soil is moderately resistant to pressure and is difficult to break between thumb and forefinger.

Soft.—When dry, soil breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle soil; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grades.

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

Diversion terrace. A channel that has a supporting ridge on the lower side. It is constructed across the slope to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Drainage terrace. A relatively deep channel and low ridge constructed across the slope primarily for drainage. It may be either a diversion terrace or a field terrace.

Erosion. The wearing away of the land surface by wind, running water, and other geological agents.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors, such as light, moisture, temperature, and the physical condition (or tilth) of the soil, are favorable.

Field terrace. A ridge 10 to 20 inches high and 15 to 30 feet wide with gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. The ridge is constructed across the direction of the slope to control erosion by diverting runoff along the contour at a safe speed. It may grade toward one or both ends. Cultivated crops may be grown over this terrace.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

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

Fragipan. A dense, brittle horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented when dry, has hard or very hard consistence, and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few to 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.

Gall spot. A very severely eroded spot or areas in which the subsoil is exposed.

Geological erosion. Normal erosion that takes place when the soil is under native vegetation and is undisturbed by human activity.

Graded stripcropping. Growing of crops in strips that are graded toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, and covered by vegetation that protects it from erosion; used to conduct surface water away from cropland.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains. The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; whereas, a rill is of lesser depth and can be smoothed over by ordinary tillage.

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 (1) distinctive characteristics caused by accumulation of clay, sesquioxides, humus, or some combination of these; (2) prismatic or blocky structure; (3) redder or stronger colors than the A horizon or (4) some combination of these. The 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 underlying 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 the A or B horizon.

Leached layer. A layer from which the soluble materials have been dissolved and washed away by percolating water.

Leached soil. A soil from which most of the soluble materials have been removed from the entire profile or have been removed from one part of the profile and have accumulated in another part.

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

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, value of 6, and chroma of 4.

Parent material, soil. The horizon of weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

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

Reaction, soil. The degree of acidity or alkalinity of a soil expressed in pH values. A soil that tests 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. The degrees of acidity or alkalinity of a soil expressed in pH values and in words are as follows:

	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.

Residual material. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residual material is not soil but is frequently the material in which a soil has formed.

Rill. A steep-sided channel resulting from accelerated erosion. A rill normally is a few inches in depth and width and is not large enough to be an obstacle to farm machinery.

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

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

Sedimentary rock. A rock composed of particles deposited from suspension in water. The chief sedimentary rocks are conglomerate, from gravel; sandstone, from sand; shale, from clay; and limestone, from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sands have been consolidated into sandstone.

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.

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 soils includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying parent material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips, or bands, to serve as vegetative barriers to wind and water erosion.

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

Subsoil. Technically, the B horizon; commonly, that part of the profile below plow depth.

Substratum. Any layer beneath the solum, or true soil; the C or R horizon.

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 (geological). An old alluvial plain ordinarily flat or undulating, bordering a river, a 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."

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

Topsoil. A presumed fertile soil or soil material, ordinarily rich in organic matter, used to topdress roadbanks, lawns, parks, and gardens.

Upland (geologic). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

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.

Weathering. All physical and chemical changes produced in rocks at or near the earth's surface by atmospheric agents. These changes result in more or less complete disintegration and decomposition of the rock.

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