SOIL SURVEY OF

# Harrison and Taylor Counties, West Virginia

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

**This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.**

**Major fieldwork for this soil survey was completed in the period 1962–72. Soil names and descriptions were approved in 1973. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1973. This survey was made cooperatively by the Soil Conservation Service and the West Virginia University Agricultural Experiment Station. It is part of the technical assistance furnished to the West Fork and Tygart Valley Soil Conservation Districts.**



# HOW TO USE THIS SOIL SURVEY

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

## Locating Soils

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

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

## Finding and Using Information

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

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

*Farmers and those who work with farmers* can learn about use and management of the soils from the soil descriptions and from information in the sections "Crops and Pasture," "Capability Grouping," "Estimated Yields," and "Woodland."

*Foresters and others* can refer to the section "Woodland," where the soils of the county are listed and assigned a woodland subclass according to their suitability for tree growth and woodland management

*Game managers, sportsmen, and others* can find information about soils and wildlife in the section "Wildlife."

*Community planners and others* can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and recreation areas in the section "Town and Country Planning."

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

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

*Newcomers in Harrison and Taylor 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 information about the county in the section "General Nature of the Survey Area" at the end of the publication.

***Cover:*** **Landscape on soil association 4. The sloping Gilpin soils are in the background, Ernest soils are on the foot slopes, and Pope and Philo soils are on the flood plain in the foreground.**

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# SOIL SURVEY OF HARRISON AND TAYLOR COUNTIES, WEST VIRGINIA

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HARRISON AND TAYLOR COUNTIES are in the north-central part of West Virginia (fig 1).

The total area is 378,880 acres, or about 592 square miles. Harrison County has 267,520 acres, or about 418 square miles, and Taylor County has 111,360 acres, or about 174 square miles The population of the two counties was 86,906 in 1970. In Harrison County it totaled 73,028 In Clarksburg, the county seat, it was 24,864, and in Bridgeport 4,777. In Taylor County the population was 13,878, and in Grafton, the county seat, 6,433.

About 45 percent of the survey area is wooded, 25 percent pastured, 11 percent cropped, and 7 percent strip mined. The 1969 Census of Agriculture shows about 42 percent of the land area, or 159,896 acres, to be in farms. Farms numbered 1,017. The average size was about 157 acres.

The growing season is favorable. Rainfall is adequate for crops commonly grown in the survey area.

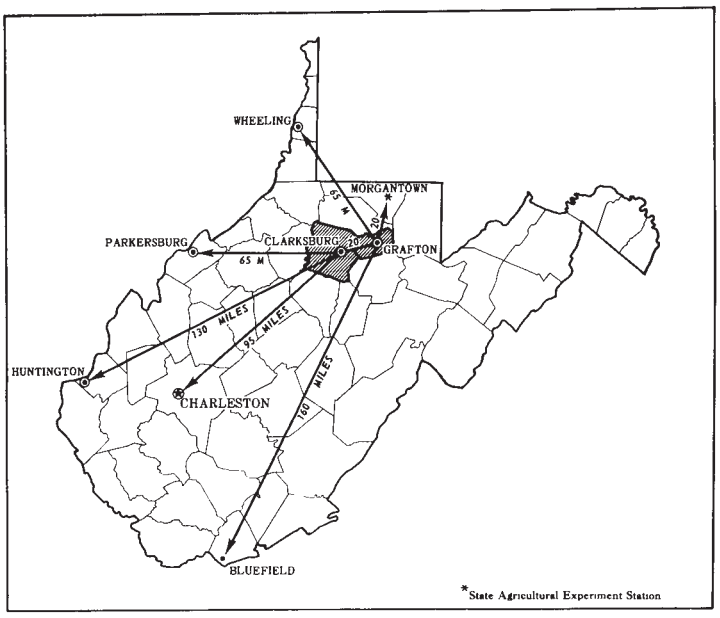


*Figure 1.*—**Location of Harrison and Taylor Counties in West Virginia.**

The raising of cattle, which is supported by many acres of pasture, is the principal farm enterprise. Dairy products are second in importance in Harrison County.

Both counties are hilly. The nearly level shale, siltstone, and sandstone of the Central Allegheny Plateau have been strongly dissected. The hills are mostly steep and very steep, and most of the major hilltops are at about the same elevation The valleys are V-shaped and, except for those near the West Fork River and its major tributaries, have very narrow flood plains.

## *How This Survey Was Made*

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

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

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

Soils of one series can differ in texture of the surface layer

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, Gilpin silt loam, 8 to 15 percent slopes, is one of several phases within the Gilpin series.

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

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

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

A soil complex consists of areas 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 and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen Gilpin-Upshur complex, 8 to 15 percent slopes, is an example

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map can be made up of only one of the dominant soils, or of two or more. If there are two or more dominant series represented in the group, the name of the group ordinarily consists of the names of the dominant soils, joined by "and." Udifluvents and Fluvaquents is the only undifferentiated group in Harrison and Taylor Counties.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Urban land is an example

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

Soil scientists observe how soils behave when used as a growing medium for native and cultivated plants, and as material for structures, foundations for structures, or backfill. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this failure to slow permeability or a high water table. They see that streets, road pavements, and foundations for houses are cracked on a given kind of soil, and they relate this failure to a high shrink-swell potential. Thus, they use observation and knowledge of soil properties, together with available research data, to predict the limitations or suitability of a soil for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others They then adjust the groups according to the results of their study and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

## General Soil Map

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

The five soil associations in Harrison and Taylor Counties are described on the following pages.

The soil association names do not fully agree with those on the general soil maps of adjacent counties published at different times. Differences are the result of improvement in the classification of soils, particularly modifications or refinements in soil series concepts Another difference is created by the pattern of occurrence of the major soils in the different surveys.

### *1. Gilpin-Upshur association*

*Gently sloping to very steep, well-drained, acid and lime-influenced soils on hilly uplands*

This hilly association is in the western third of Harrison County. It is the most rugged part of the two counties. For the most part the ridgetops, benches, and flood plains are very narrow. Rock outcrop is common in some areas (fig. 2).

This association makes up about 22 percent of the survey area It is about 65 percent Gilpin soils, 25 percent Upshur soils, and 10 percent minor soils

Gilpin soils are moderately deep, well-drained, gently sloping to very steep soils on uplands. They formed in acid material weathered from interbedded shale, siltstone, and sandstone. They have a dark grayish-brown, medium-

*Figure 2.*—**Narrow valleys, very steep hills, and benches of the Gilpin-Upshur association.**

textured surface layer and a yellowish-brown, medium-textured and moderately fine textured subsoil that is channery in the lower part. In places they have stones on the surface.

Upshur soils are moderately deep and deep, well-drained, strongly sloping to very steep soils on uplands. They formed in lime-influenced material weathered from red shale. They have a dark reddish-gray, moderately fine or fine textured surface layer and a dark reddish-brown to weak-red, fine-textured subsoil. They are susceptible to slipping.

Minor in this association are the well drained Vandalia soils on foot slopes and the moderately well drained Lindside soils and poorly drained Melvin soils on narrow flood plains.

Most of this association has been cleared and used mainly for pasture or hay. Many of the steeper and less accessible areas, however, are idle or have reverted to trees. Farming is general. Beef cattle is the main livestock enterprise. Erosion is severe in most areas, and slips are common. The narrow flood plains are subject to flooding.

The slope, the permeability, the depth over bedrock, the shrink-swell potential, and the hazard of soil slippage should be considered in planning homesites and in locating roads or septic tank absorption fields. The flood hazard and the seasonal high water table on very narrow flood plains should also be considered.

### *2. Westmoreland-Clarksburg-Strip mines association*

*Gently sloping to very steep, well drained and moderately well drained, lime-influenced soils on hilly uplands and foot slopes and in associated surface-mined areas*

This hilly association is in the eastern two-thirds of Harrison County and the southwestern part of Taylor County. The ridgetops and benches are broader and the flood plains are slightly wider than those in association 1. Rock crops out in a few places.

This association makes up about 56 percent of the survey area. It is about 42 percent Westmoreland soils, 11 percent Clarksburg soils, 9 percent Strip mines, and 38 percent minor soils.

Westmoreland soils are deep, well-drained, strongly sloping to very steep soils on uplands. They formed in lime-influenced material weathered from interbedded shale, siltstone, sandstone, and thin layers of limestone. They have a dark grayish-brown, medium-textured surface layer and a yellowish-brown and brown, moderately fine textured subsoil that is generally channery.

Clarksburg soils are deep, moderately well drained, gently sloping to moderately steep soils on foot slopes. They formed in lime-influenced colluvial material that moved downslope

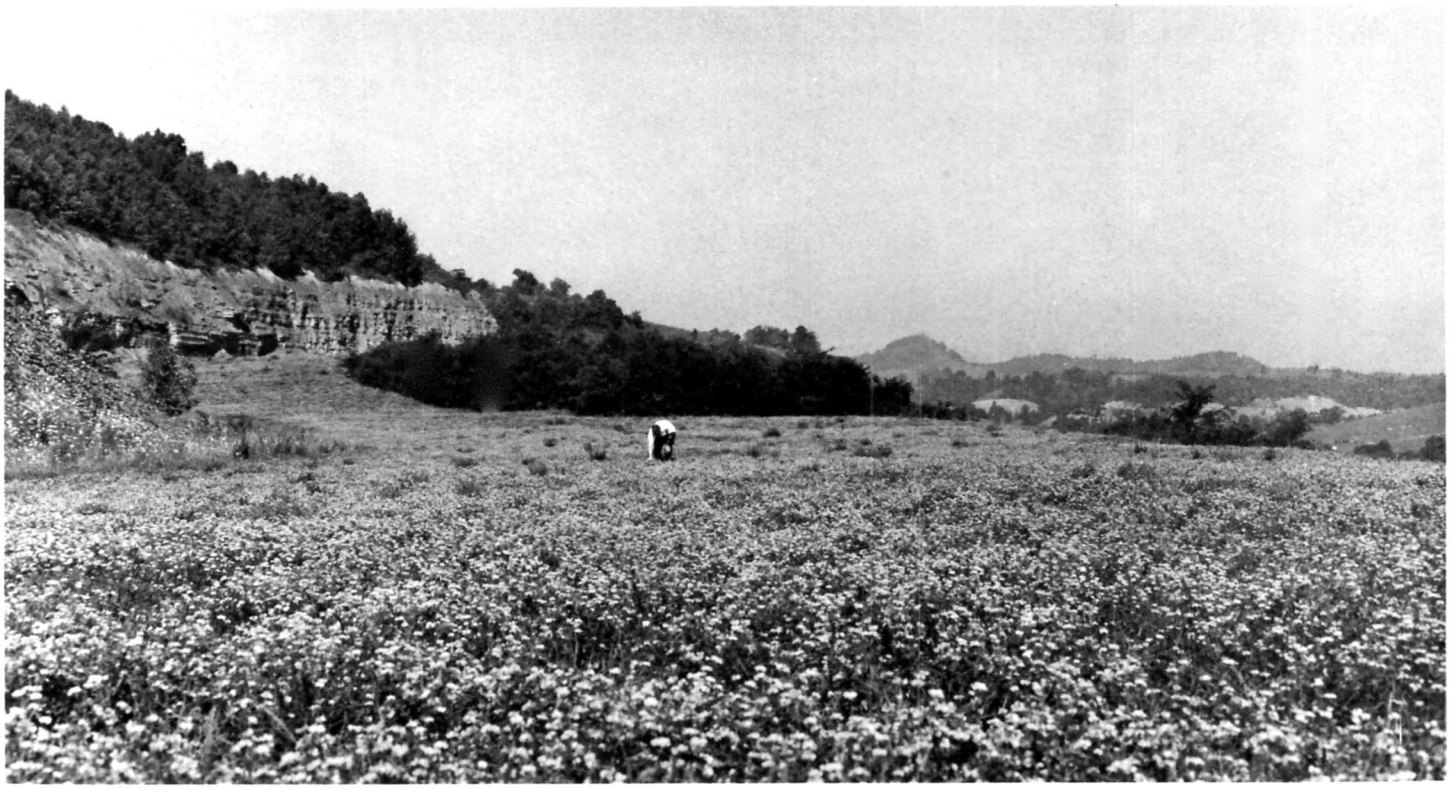

*Figure 3.*—**An area of Strip mines, partly revegetated in the Westmoreland-Clarksburg-Strip mines association. Westmoreland soils are above the high walls.**

mainly from Westmoreland soils on uplands. They have a dark grayish-brown, medium-textured surface layer and a yellowish-brown to strong-brown and brown, medium-textured to moderately fine textured subsoil that is mottled in the middle and lower parts. In the lower part of the subsoil, they have a fragipan through which water and air move slowly or moderately slowly. They also have a seasonal high water table.

Strip mines is a mixture of soil material and rock and coal fragments, all of which have resulted from surface mining. It also includes the graded and ungraded spoil and the adjacent high wall (fig. 3).

Minor in this association are the well drained Gilpin, Upshur, and Faywood soils; the moderately well drained Guernsey soils on uplands; and the moderately well drained Lindside soils and poorly drained Melvin soils on narrow flood plains.

Most of this association has been cleared and used mainly for pasture or hay (fig. 4). Many of the steeper and less accessible areas, however, are idle or have reverted to trees. Farming is general. Beef cattle is the main livestock enterprise. Erosion is mostly moderate to severe, and slips are evident in places. The narrow flood plains are subject to flooding.

The slope, the permeability, the depth over bedrock, the shrink-swell potential, the depth to seasonal high water table, and the hazard of slippage should be considered in planning homesites and in locating roads or septic tank absorption fields. The flood hazard on narrow flood plains should also be considered.

### *3. Monongahela-Lindside-Clarksburg association*

*Nearly level to moderately steep, moderately well drained, acid and lime-influenced soils on stream terraces, flood plains and foot slopes*

The landscape of this association is one of terraces, flood plains, and foot slopes along the West Fork River and its major tributaries in Harrison County (fig. 5).

This association makes up about 5 percent of the two counties. It is about 35 percent Monongahela soils, 16 percent Lindside soils, 10 percent Clarksburg soils, and 39 percent minor soils.

Monongahela soils are deep, moderately well drained, gently sloping to strongly sloping soils on stream terraces. They formed in old, acid alluvial material washed from soils underlain by interbedded shale, siltstone, and sandstone. They have a dark-brown, medium-textured surface layer and a yellowish-brown to strong-brown, medium-textured to moderately fine textured subsoil that is mottled in the lower part. In the lower part of the subsoil, they have a fragipan through which water and air move slowly or moderately slowly. They also have a seasonal high water table.

Lindside soils are deep, moderately well drained, nearly level soils on flood plains. They formed in lime-influenced alluvial material washed from soils underlain by interbedded shale, siltstone, sandstone, and thin layers of limestone. They have a dark grayish-brown, medium-textured surface layer and a dark-brown, medium-textured to moderately fine textured subsoil. They have a seasonal high water table and are subject to flooding.

*Figure 4.*—**Westmoreland and Clarksburg soils on soil association 2.**

Clarksburg soils are deep, moderately well drained, gently sloping to moderately steep soils on foot slopes. They formed in lime-influenced colluvial material that moved downslope mainly from Westmoreland soils on uplands. They have a dark grayish-brown, medium-textured surface layer and a yellowish-brown to strong-brown and brown, medium-textured to moderately fine textured subsoil that is mottled in the middle and lower parts. In the lower part of the subsoil, they have a fragipan through which water and air move slowly or moderately slowly. They also have a seasonal high water table.

Minor in this association are the well drained Allegheny soils, moderately well drained Zoar soils, and somewhat poorly drained Tygart soils on terraces; and the well drained Hackers and Nolin soils and poorly drained Melvin soils on flood plains.

Most of this association has been cleared and used mainly for hay or cultivated crops. The foot slopes are mostly in hay or pasture. In most places the soils are slightly to moderately eroded. In the Gypsy area, however, some are severely eroded.

The major towns of Harrison County are within this association. Slope, permeability, shrink-swell potential, depth to seasonal high water table, and flood hazard should be considered in planning homesites and in locating roads or septic tank absorption fields.

### *4. Gilpin-Ernest association*

*Gently sloping to very steep, well drained and moderately well drained, acid soils on hilly uplands and foot slopes*

This association is the gorge-like area along the Tygart River and the hilly, broad plateau-like area in the northwestern part of Taylor County. The flood plains are narrow. Rock outcrop is common in some areas.

This association makes up about 5 percent of the survey area. It is about 65 percent Gilpin soils, 25 percent Ernest soils, and 10 percent minor soils.

Gilpin soils are moderately deep, well-drained, gently sloping to very steep soils on uplands. They formed in acid material weathered from interbedded shale, siltstone, and sandstone. They have a dark grayish-brown, medium-textured surface layer and a yellowish-brown, medium-textured to moderately fine textured subsoil that is channery in the lower part. In places they have stones on the surface.

Ernest soils are deep, moderately well drained, gently sloping to steep soils on foot slopes. They formed in acid colluvial material that moved downslope mainly from Gilpin soils on uplands. They have a dark grayish-brown, medium-textured surface layer and a yellowish-brown to light yellowish-brown, moderately fine textured subsoil that may be channery and that is mottled in the middle and lower parts. In the lower part of the subsoil, they have a fragipan through

*Figure 5.*—**Soils on flood plains and terraces along Elk Creek in the Monongahela-Lindside-Clarksburg association.**

which water and air move slowly or moderately slowly. They also have a seasonal high water table, and in some areas stones are on the surface.

Minor in this association are the well drained Rayne soils and moderately well drained Wharton and Cookport soils on broader upland flats; and the well drained Pope soils, moderately well drained Philo soils, and poorly drained Atkins soils on narrow flood plains.

Most of this association has been cleared and used mainly for pasture or hay. Much of it, however, is idle or has reverted to trees. Farming is general. Beef cattle is the main livestock enterprise. Erosion is mostly moderate. The narrow flood plains are subject to flooding.

The slope, the permeability, the depth over bedrock, the depth to seasonal high water table, and the stones should be considered in planning homesites and in locating roads and septic tank absorption fields. The flooding hazard on narrow flood plains should also be considered.

### *5. Culleoka-Gilpin-Ernest association*

*Gently sloping to very steep, well drained and moderately well drained, lime-influenced and acid soils on hilly uplands and foot slopes*

This hilly association is in the eastern half of Taylor County. In some areas the ridgetops are fairly broad flats. The benches and flood plains are narrow. Rock crops out in a few places.

This association makes up about 12 percent of the survey area. It is about 37 percent Culleoka soils, 30 percent Gilpin soils, 15 percent Ernest soils, and 18 percent minor soils.

Culleoka soils are moderately deep, well-drained, strongly sloping to very steep soils on uplands. They formed in lime-influenced material weathered from interbedded shale, siltstone, sandstone, and thin layers of limestone. They have a dark-brown, medium textured surface layer and a strong-brown, medium-textured to moderately fine textured subsoil that is shaly in the lower part.

Gilpin soils are moderately deep, well-drained, gently sloping to very steep soils on uplands. They formed in acid material weathered from interbedded shale, siltstone, and sandstone. They have a dark grayish-brown, medium-textured surface layer and a yellowish-brown, medium-textured to moderately fine textured subsoil that is channery in the lower part. In places they have stones on the surface.

Ernest soils are deep, moderately well drained, gently sloping to steep soils on foot slopes. They formed in acid colluvial material that moved downslope mainly from Gilpin soils on uplands. They have a dark grayish-brown, medium-textured surface layer and a yellowish-brown to light yellowish-brown, moderately fine textured subsoil that is channery in places and is mottled in the middle and lower parts. In the lower part of the subsoil, they have a fragipan through which water and air move slowly or moderately slowly.

They also have a seasonal high water table, and in places stones are on the surface.

Minor in this association are the moderately well drained Rayne soils and moderately well drained Wharton and Cookport soils on broader upland flats; and the well drained Pope soils, moderately well drained Philo soils, and poorly drained Atkins soils on narrow flood plains.

Except for the area north and east of Thornton, most of this association has been cleared and used mainly for pasture or hay (fig. 6). Some areas, however, mostly the very stony soils, are idle or have reverted to trees. Farming is general. Beef cattle is the main livestock enterprise. Erosion is mostly moderate to severe. The narrow flood plains are subject to flooding.

The slope, the permeability, the depth to bedrock, the depth to seasonal high water table, and the stones should be considered in planning homesites and in locating roads or septic tank absorption fields. The flood hazard on narrow flood plains should also be considered.

## *Descriptions of the Soils*

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

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Color terms are for the moist soil unless otherwise stated. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit differs from the one described for the series, the differences are stated in the description of the mapping unit or are apparent in the name of the mapping unit.

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

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

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in de-

*Figure 6.*—**Hay and pasture on Culleoka, Gilpin, and Ernest soils in association 5.**

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

| Soil | Harrison County | | Taylor County | | Total acres | Total percent of survey area |
|---|---|---|---|---|---|---|
| | Acres | Percent | Acres | Percent | | |
| Allegheny silt loam, 8 to 15 percent slopes | 1,188 | 0.4 | 63 | 0.1 | 1,251 | 0.3 |
| Allegheny silt loam, 15 to 25 percent slopes | 263 | 1 | | | 263 | 1 |
| Atkins silt loam | 108 | (1) | 603 | 5 | 711 | 2 |
| Chavies fine sandy loam | 388 | 1 | 176 | 2 | 564 | .1 |
| Clarksburg silt loam, 3 to 8 percent slopes | 598 | 2 | 140 | 1 | 738 | 2 |
| Clarksburg silt loam, 8 to 15 percent slopes | 8,916 | 3.3 | 3,200 | 2.9 | 12,116 | 3.2 |
| Clarksburg silt loam, 15 to 25 percent slopes | 10,281 | 3.9 | 877 | 8 | 11,158 | 2.9 |
| Clarksburg silt loam, 15 to 25 percent slopes, severely eroded | 1,050 | 4 | 63 | 1 | 1,113 | 3 |
| Cookport silt loam, 3 to 8 percent slopes | 75 | (1) | 977 | 9 | 1,052 | 3 |
| Cookport silt loam, 8 to 15 percent slopes | 38 | (1) | 503 | 4 | 541 | 1 |
| Culleoka silt loam, 8 to 15 percent slopes | | | 2,559 | 2.3 | 2,559 | 7 |
| Culleoka silt loam, 15 to 25 percent slopes | | | 3,454 | 3.1 | 3,454 | 9 |
| Culleoka silt loam, 25 to 35 percent slopes | | | 6,652 | 6.0 | 6,652 | 1.8 |
| Culleoka silt loam, 25 to 35 percent slopes, severely eroded | | | 1,396 | 1.2 | 1,396 | 4 |
| Culleoka silt loam, 35 to 60 percent slopes, severely eroded | | | 3,186 | 2.9 | 3,186 | 8 |
| Dekalb sandy loam, 8 to 15 percent slopes | | | 281 | 2 | 281 | 1 |
| Dekalb extremely stony sandy loam, very steep | | | 527 | 5 | 527 | 1 |
| Ernest silt loam, 3 to 8 percent slopes | | | 287 | 3 | 287 | 1 |
| Ernest silt loam, 8 to 15 percent slopes | | | 3,047 | 2.7 | 3,047 | 8 |
| Ernest silt loam, 15 to 25 percent slopes | | | 271 | 2 | 271 | 1 |
| Ernest very stony silt loam, 3 to 15 percent slopes | | | 5,347 | 4.8 | 5,347 | 1.4 |
| Ernest very stony silt loam, 15 to 35 percent slopes | | | 5,600 | 5.0 | 5,600 | 1.5 |
| Faywood silty clay loam, 8 to 15 percent slopes | 444 | 2 | 74 | 1 | 518 | 1 |
| Faywood silty clay loam, 15 to 25 percent slopes | 452 | 2 | 20 | (1) | 472 | .1 |
| Faywood silty clay loam, 25 to 35 percent slopes | 449 | 2 | 12 | (1) | 461 | 1 |
| Faywood silty clay loam, 35 to 60 percent slopes | 341 | 1 | | | 341 | 1 |
| Fluvaquents, overwash | 899 | 3 | 13 | (1) | 912 | .2 |
| Gilpin silt loam, 3 to 8 percent slopes | 174 | 1 | 116 | 1 | 290 | 1 |
| Gilpin silt loam, 8 to 15 percent slopes | 538 | 2 | 3,242 | 2.9 | 3,780 | 1.0 |
| Gilpin silt loam, 15 to 25 percent slopes | 1,619 | 6 | 3,448 | 3.1 | 5,067 | 1.3 |
| Gilpin silt loam, 25 to 35 percent slopes | 1,905 | 7 | 3,111 | 2.8 | 5,016 | 1.3 |
| Gilpin silt loam, 35 to 60 percent slopes | 4,400 | 1.7 | 832 | 7 | 5,232 | 1.4 |
| Gilpin very stony silt loam, 3 to 15 percent slopes | 60 | (1) | 979 | 9 | 1,039 | 3 |
| Gilpin very stony silt loam, 15 to 35 percent slopes | 244 | 1 | 15,950 | 14.3 | 16,194 | 4.3 |
| Gilpin very stony silt loam, very steep | 1,597 | 6 | 8,845 | 8.0 | 10,442 | 2.8 |
| Gilpin-Upshur complex, 8 to 15 percent slopes | 1,028 | 4 | 197 | 2 | 1,225 | 3 |
| Gilpin-Upshur complex, 8 to 15 percent slopes, severely eroded | 2,354 | 9 | 575 | 5 | 2,929 | 8 |
| Gilpin-Upshur complex, 15 to 25 percent slopes | 3,956 | 1.5 | 271 | 2 | 4,227 | 1.1 |
| Gilpin-Upshur complex, 15 to 25 percent slopes, severely eroded | 10,797 | 4.0 | 408 | 4 | 11,205 | 3.0 |
| Gilpin-Upshur complex, 25 to 35 percent slopes | 2,307 | 9 | 107 | 1 | 2,414 | 6 |
| Gilpin-Upshur complex, 25 to 35 percent slopes, severely eroded | 24,345 | 9.1 | 629 | 6 | 24,974 | 6.6 |
| Gilpin-Upshur complex, 35 to 70 percent slopes, severely eroded | 44,227 | 16.5 | 176 | 2 | 44,403 | 11.7 |
| Guernsey silt loam, 3 to 8 percent slopes | 253 | 1 | 98 | 1 | 351 | 1 |
| Guernsey silt loam, 8 to 15 percent slopes | 6,959 | 2.6 | 482 | 4 | 7,441 | 2.0 |
| Guernsey silt loam, 15 to 25 percent slopes | 4,779 | 1.8 | 67 | 1 | 4,846 | 1.3 |
| Guernsey silt loam, 15 to 25 percent slopes, severely eroded | 602 | 2 | | | 602 | 2 |
| Hackers silt loam | 710 | 3 | | | 710 | 2 |
| Lindside silt loam | 3,869 | 1.5 | 882 | 8 | 4,751 | 1.2 |
| Melvin silt loam | 1,461 | 6 | 713 | 6 | 2,174 | 6 |
| Monongahela silt loam, 3 to 8 percent slopes | 4,825 | 1.8 | 126 | .1 | 4,951 | 1.3 |
| Monongahela silt loam, 8 to 15 percent slopes | 1,966 | 7 | 59 | 1 | 2,025 | 5 |
| Nolin silt loam | 681 | 3 | | | 681 | 2 |
| Philo silt loam | 477 | 2 | 518 | 5 | 995 | 3 |
| Pope silt loam | 135 | 1 | 96 | 1 | 231 | 1 |
| Rayne silt loam, 3 to 8 percent slopes | 25 | (1) | 400 | 4 | 425 | 1 |
| Rayne silt loam, 8 to 15 percent slopes | | | 176 | 2 | 176 | (1) |
| Strip mines | 21,746 | 8.1 | 3,075 | 2.8 | 24,821 | 6.6 |
| Tygart silt loam | 460 | 2 | 58 | 1 | 518 | 1 |
| Udifluvents and Fluvaquents | 5,892 | 2.2 | 1,132 | 1.0 | 7,024 | 1.9 |
| Upshur silty clay, 8 to 15 percent slopes, severely eroded | 330 | 1 | 34 | (1) | 364 | .1 |
| Upshur silty clay, 15 to 25 percent slopes, severely eroded | 586 | 2 | 13 | (1) | 599 | .2 |
| Urban land | 4,069 | 1.5 | 830 | 7 | 4,899 | 1.3 |
| Vandalia silty clay loam, 3 to 8 percent slopes | 366 | 1 | | | 366 | 1 |
| Vandalia silty clay loam, 8 to 15 percent slopes | 2,218 | 8 | | | 2,218 | 6 |
| Vandalia silty clay loam, 15 to 25 percent slopes | 1,533 | 6 | | | 1,533 | 4 |
| Vandalia silty clay loam, 15 to 25 percent slopes, severely eroded | 436 | 2 | | | 436 | 1 |
| Westmoreland silt loam, 8 to 15 percent slopes | 3,576 | 1.3 | 2,303 | 2.1 | 5,879 | 1.5 |
| Westmoreland silt loam, 8 to 15 percent slopes, severely eroded | 303 | .1 | 229 | .2 | 532 | 1 |
| Westmoreland silt loam, 15 to 25 percent slopes | 9,956 | 3.7 | 4,932 | 4.4 | 14,888 | 3.9 |

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

| Soil | Harrison County | | Taylor County | | Total acres | Total percent of survey area |
|---|---|---|---|---|---|---|
| | Acres | Percent | Acres | Percent | | |
| Westmoreland silt loam, 15 to 25 percent slopes, severely eroded | 1,931 | 0 7 | 851 | 0 8 | 2,782 | 0 7 |
| Westmoreland silt loam, 25 to 35 percent slopes | 23,489 | 8 8 | 4,670 | 4 2 | 28,159 | 7 4 |
| Westmoreland silt loam, 25 to 35 percent slopes, severely eroded | 8,355 | 3 1 | 2,610 | 2 3 | 10,965 | 2 9 |
| Westmoreland silt loam, 35 to 60 percent slopes | 26,940 | 10 1 | 5,950 | 5 3 | 32,890 | 8 7 |
| Wharton silt loam, 8 to 15 percent slopes | 96 | (1) | 1,710 | 1 5 | 1,806 | 5 |
| Wharton silt loam, 15 to 25 percent slopes | | | 376 | 3 | 376 | 1 |
| Zoar silt loam, 3 to 8 percent slopes | 270 | 1 | 19 | (1) | 289 | 1 |
| Zoar silt loam, 8 to 15 percent slopes | 274 | 1 | | | 274 | 1 |
| Cut and fill land | 804 | 3 | 144 | 1 | 948 | 2 |
| Mine dumps | 362 | 1 | 18 | (1) | 380 | 1 |
| Ponds and lakes less than 40 acres in size and streams less than 1/8 mile wide | 1,745 | 7 | 575 | 5 | 2,320 | 6 |
| Total | 267,520 | 100 0 | 111,360 | 100 0 | 378,880 | 100 0 |

[1] Less than 0.05 percent.

scribing soils can be found in the Glossary at the end of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*9*).[1]

## Allegheny Series

The Allegheny series consists of deep, well-drained soils on stream terraces. These soils formed in old, acid alluvial material washed from soils underlain by shale, siltstone, and sandstone. They are mainly along the West Fork River in Harrison County. Slopes range from 8 to 25 percent.

In a representative profile, the surface layer is brown silt loam about 5 inches thick. The strong-brown subsoil extends to a depth of 35 inches. The upper 7 inches is firm silt loam, the next 10 inches is firm clay loam, the next 13 inches is very firm clay loam, and the lower 6 inches is mixed grayish-brown and yellowish-brown firm sandy loam The underlying material is strong-brown gravelly sandy loam that extends to a depth of 52 inches or more.

Allegheny soils have low to moderate natural fertility. The available moisture capacity is moderate to high. Permeability is moderate in the subsoil.

Allegheny soils are easily worked and are suited to crops commonly grown in the survey area. Most of the acreage is cleared and used mainly for cultivated crops or hay.

The slope is the main limitation to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Allegheny silt loam, 8 to 15 percent slopes, in an idle field one-fourth mile northeast of Dawmont Post Office, Harrison County:

Ap—0 to 5 inches, brown (10YR 5/3) silt loam; moderate, fine, granular structure; friable; many roots; strongly acid; clear, smooth boundary

B1t—5 to 12 inches, strong-brown (7.5YR 5/6) silt loam, moderate, very fine, subangular blocky structure, firm, slightly sticky; many roots; thin, discontinuous clay films, strongly acid; gradual, smooth boundary

B21t—12 to 22 inches, strong-brown (7.5YR 5/6) clay loam; moderate, fine, subangular blocky structure; firm; common roots; moderately thick, nearly continuous clay films; strongly acid; gradual, smooth boundary.

B22t—22 to 35 inches, strong-brown (7.5YR 5/6) clay loam; moderate, medium to very fine, subangular blocky structure; very firm; few roots; thin, discontinuous clay films; strongly acid; gradual, smooth boundary

B3—35 to 41 inches, mixed grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) sandy loam; weak, fine, subangular blocky structure; firm, few roots; 5 percent coarse fragments; strongly acid; clear, irregular boundary.

C—41 to 52 inches, strong-brown (7 5YR 5/6) gravelly sandy loam; massive; 30 percent coarse fragments; strongly acid

Depth to bedrock is generally greater than 5 feet Thickness of the solum ranges from 30 to 60 inches. Unlimed soils are strongly acid to very strongly acid throughout The gravel content ranges from 0 to 10 percent in the A and B horizons and up to 30 percent in the C horizon

The Ap horizon is mainly 10YR hue, value of 4 or 5, and chroma of 2 or 3 The Bt horizon is mainly 7.5YR hue, value of 4 or 5, and chroma of 4 or 6; or 10YR hue, value of 5, and chroma of 4 or 6. The B2 horizon is clay loam or sandy clay loam. The C horizon is clay loam, sandy clay loam, loam, or sandy loam, or their gravelly analogs

Allegheny soils are near the moderately well drained Monongahela and Zoar soils and the somewhat poorly drained Tygart soils. They are better drained than any of those soils. They do not have a fragipan, which is characteristic of Monongahela soils. They have a coarser textured B horizon than Zoar and Tygart soils.

**Allegheny silt loam, 8 to 15 percent slopes** (AgC) — This strongly sloping soil has the profile described as representative of the series. It is on broad terraces and benches. Included in mapping are small areas of Monongahela and Zoar soils, a few small areas where the soil is shallower over bedrock or less sloping than is typical, a few areas where the surface layer is loam or fine sandy loam, and small areas near Hepzibah and Gypsy in Harrison County where the soil is severely eroded.

This Allegheny soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is severe in unprotected areas. Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IIIe-4, woodland subclass 2o.

**Allegheny silt loam, 15 to 25 percent slopes** (AgD).— Except for a thinner surface layer and subsoil, this soil has a profile similar to the one described as representative of the

[1] Italic numbers in parentheses refer to References, p. 78.

series. It is mainly along the outer edges of terraces and along slopes above drainageways. Included in mapping are small areas of Monongahela soils, a few small areas where the soil is shallower over bedrock or steeper than is typical, a few areas where the surface layer is loam or fine sandy loam, and a few where the soil is severely eroded

This Allegheny soil has limited suitability for cultivated crops and is better suited to hay and pasture The erosion hazard is severe in unprotected areas Minimum tillage, cultivation on the contour, striperops on the contour, hay in the cropping system, and the return of crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IVe-3; woodland subclass 2r.

## Atkins Series

The Atkins series consists of deep, poorly drained soils on flood plains. These soils formed in acid alluvial material washed from soils underlain by sandstone, siltstone, and shale. They are along streams mostly in the western one-third of Harrison County and the northern and eastern two-thirds of Taylor County They are subject to flooding. Slopes are mostly less than 3 percent.

In a representative profile, the surface layer is gray silt loam mottled with yellowish brown and is about 11 inches thick. The subsoil extends to a depth of 48 inches. The upper 11 inches is light-gray, friable silt loam mottled with yellowish brown, and the lower 26 inches is gray, friable light silty clay loam mottled with strong brown. The underlying material is mixed light-gray, gray, and strong-brown, stratified light silty clay loam, loam, and silt loam that extends to a depth of 56 inches or more.

Atkins soils have moderate natural fertility. The available moisture capacity is high. Permeability is slow to moderately slow in the subsoil A seasonal high water table is at or near the surface.

Drainage is needed on these soils before desirable crops can be grown. If the soils are drained, commonly grown cultivated crops and hay and pasture plants that tolerate some wetness can be grown. A deep-rooted legume, such as alfalfa, is likely to be short-lived in this wet soil Most areas are cleared and are mainly used for pasture or hay.

The seasonal high water table, the slow to moderately slow permeability, and the flood hazard are the main limitations to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Atkins silt loam, in a hayfield along State Route 9, northwest of Tygart Lake Country Club, Taylor County:

Ap—0 to 11 inches, gray (10YR 5/1) silt loam; few, medium, faint, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure parting to moderate, medium, granular; friable; many roots; strongly acid; abrupt, wavy boundary.

B21g—11 to 22 inches, light-gray (10YR 7/1) silt loam; many, medium, faint, yellowish-brown (10YR 5/8) mottles, moderate, medium, prismatic structure parting to moderate, medium, subangular blocky; friable; few roots; strongly acid; gradual, wavy boundary.

B22g—22 to 48 inches, gray (10YR 6/1) light silty clay loam; many, medium, distinct, strong-brown (7.5YR 5/8) mottles; moderate, medium, prismatic structure parting to weak, medium, subangular blocky, friable; few roots; strongly acid; clear, wavy boundary

Cg—48 to 56 inches, mixed light-gray (N 7/0), gray (N 5/0), and strong-brown (7.5YR 5/8), stratified light silty clay loam, loam, and silt loam; massive; firm; very strongly acid.

Depth to bedrock is generally greater than 4 feet Thickness of the solum ranges from 30 to 50 inches Unlimed soils are strongly acid to very strongly acid throughout The content of coarse fragments ranges from 0 to 10 percent in the A and B horizons, but is somewhat higher in the C horizon.

The Ap horizon is mostly 10YR hue; value of 4, 5, or 6, and chroma of 1 or 2 The B horizon is mostly 10YR hue, value of 5, 6, or 7, and chroma of 1. It is dominantly light silty clay loam, but in places is clay loam, silt loam, loam, and fine sandy loam The C horizon is stratified light silty clay loam, silt loam, or loam.

Atkins soils are near the well drained Chavies and Pope soils and the moderately well drained Philo soils They are less well drained than any of those soils They have finer textured A and B horizons than Chavies soils and are flooded more frequently They have a finer textured B horizon than Pope and Philo soils

**Atkins silt loam** (At).—This nearly level soil is commonly in long, narrow, concave areas and is subject to flooding Surface drainage is generally poor, and water can pond for long periods in some areas Included in mapping are small areas of Philo soils, a few small areas where the surface layer is fine sandy loam, and a few where the subsoil is heavy sandy loam

If adequately drained, this Atkins soil is suited to cultivated crops. It is better suited, however, to water-tolerant grasses and legumes for hay and pasture. A delay in pasturing or tilling this wet soil until it is reasonably dry and firm can prevent compaction and loss of tilth. Capability unit IIIw-1, woodland subclass 1w

## Chavies Series

The Chavies series consists of deep, well-drained soils on high flood plains These soils formed in acid alluvial material washed from soils underlain by sandstone, siltstone, and shale They are mostly along Tenmile Creek in Harrison County and the Tygart Valley River in Taylor County. They are rarely flooded. Slopes are mostly less than 3 percent.

In a representative profile, the surface layer is dark grayish-brown fine sandy loam about 7 inches thick. The brown subsoil extends to a depth of 36 inches. The upper 6 inches is very friable fine sandy loam, the next 9 inches is friable heavy fine sandy loam, and the lower 14 inches is friable fine sandy loam. The underlying material is brown, stratified fine sandy loam and loamy sand that extends to a depth of 53 inches or more.

Chavies soils have moderate natural fertility. The available moisture capacity is moderate to high. Permeability is moderately rapid in the subsoil.

These soils are easily worked and are well suited to crops commonly grown in the survey area. Most of the acreage is cleared and used mainly for cultivated crops or hay.

The flood hazard is the main limitation to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Chavies fine sandy loam, in a nursery stock field along the west side of Tygart Valley River, one-fourth mile south of Camp Towels (4-H Camp), Taylor County:

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

B1—7 to 13 inches, brown (7 5YR 4/4) fine sandy loam; weak, fine, subangular blocky structure; very friable; common roots; strongly acid; clear, wavy boundary.

B21t—13 to 22 inches, brown (7.5YR 5/4) heavy fine sandy loam; moderate, medium, subangular blocky structure; friable; few roots; thin, discontinuous clay films; strongly acid; clear, wavy boundary.

B22t—22 to 36 inches, brown (7.5YR 4/4) fine sandy loam; weak, medium, subangular blocky structure; friable; few roots; thin, discontinuous clay films; strongly acid; clear, wavy boundary.
C—36 to 53 inches, stratified, brown (7.5YR 4/4) fine sandy loam and brown (7.5YR 5/4) loamy sand; massive and single grained; friable and loose; few fine roots, strongly acid.

Depth to bedrock is generally greater than 5 feet. Thickness of the solum ranges from 30 to 45 inches. Unlimed soils are medium acid to strongly acid throughout. The content of gravel in the A and B horizons ranges from 0 to 20 percent, but typically no gravel is within a depth of 30 inches

The Ap horizon is 10YR or 7.5YR hue; value of 4 or 5; and chroma of 2, 3, or 4. The B horizon is mostly 7.5YR or 10YR hue, value of 4 or 5, and chroma of 4 or 6. It is loam, light silt loam, or fine sandy loam The C horizon is commonly stratified fine sandy loam and loamy sand.

Chavies soils are near the well drained Pope soils, the moderately well drained Philo soils, and the poorly drained Atkins soils They have a coarser textured Ap horizon and are flooded less frequently than any of those soils They are better drained than either Philo or Atkins soils and have a coarser textured B horizon than Atkins soils

**Chavies fine sandy loam** (Ch).—This nearly level soil is on high flood plains and is rarely flooded. Included in mapping are a few small areas of Hackers soils and a few small areas where the subsoil is light sandy clay loam or sandy loam.

This Chavies soil is well suited to commonly grown cultivated crops and to hay and pasture. Cultivated crops can be grown year after year, but the protection of a cover crop is needed. Working the cover crop into the soil maintains fertility and good tilth. Capability unit I-6; woodland subclass 2o

## Clarksburg Series

The Clarksburg series consists of deep, moderately well drained soils on foot slopes. These soils formed in lime-influenced colluvial material moved downslope mainly from Westmoreland soils on uplands. They are dominantly in the eastern two-thirds of Harrison County and in the southwestern part of Taylor County. Slopes range from 3 to 25 percent.

In a representative profile, the surface layer is dark grayish-brown silt loam about 8 inches thick. The subsoil extends to a depth of 52 inches or more. The upper 4 inches is yellowish-brown, friable silt loam; the next 12 inches is strong-brown, friable silty clay loam; the next 8 inches is yellowish-brown, firm silty clay loam mottled with light brownish gray and strong brown; and the lower 20 inches or more, which is a very firm and brittle fragipan, is brown light silty clay loam mottled with light gray and strong brown.

Clarksburg soils have moderate to high natural fertility. The available moisture capacity is moderate. Permeability is moderate in the subsoil above the fragipan, but slow in the pan. A seasonal high water table is at a depth of 1½ to 2 feet.

These soils are suited to crops commonly grown in the survey area. Most of the acreage either is cleared and used mainly for pasture or is idle. The fragipan in the subsoil restricts roots and the movement of water through the soil. This restriction can affect the growth of a deep-rooted legume, such as alfalfa.

Because these soils are on foot slopes, they are commonly used as building sites and road locations. The seasonal high water table, the slope, and the low permeability, however, are limitations to be considered in planning homesites and in locating roads or septic tank absorption fields Soil slippage is a hazard on the more sloping Clarksburg soils.

Representative profile of Clarksburg silt loam, 8 to 15 percent slopes, in an idle field one-half mile northwest of Bridgeport, Harrison County

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, subangular blocky structure; friable; many roots, slightly acid; abrupt, smooth boundary
B1—8 to 12 inches, yellowish-brown (10YR 5/4) silt loam; moderate, fine, subangular blocky structure; friable; many roots; strongly acid; gradual, smooth boundary
B21t—12 to 24 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, fine, subangular blocky structure; friable; common roots; thin, continuous clay films; 5 percent coarse fragments; strongly acid; gradual, smooth boundary.
B22t—24 to 32 inches, yellowish-brown (10YR 5/6) silty clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/8) mottles; moderate, fine and medium, subangular blocky structure; firm; few roots; thin, discontinuous clay films; 5 percent coarse fragments; strongly acid; gradual, smooth boundary.
Bx—32 to 52 inches, brown (10YR 5/3) light silty clay loam; many, coarse, distinct, light-gray (10YR 7/2) and strong-brown (7.5YR 5/8) mottles; moderate, very coarse, prismatic structure; very firm, brittle; many manganese concretions, 10 percent coarse fragments; medium acid

Depth to bedrock is generally greater than 5 feet Thickness of the solum ranges from 40 to more than 52 inches Depth to low chroma mottles ranges from 20 to 30 inches Depth to the fragipan ranges from 24 to 36 inches Unlimed soils are strongly acid to medium acid in the Ap horizon and the upper part of the B horizon and medium acid to slightly acid in the lower part of the B horizon and in the C horizon The content of coarse fragments ranges from 0 to 10 percent in the Ap, B, and Bt horizons and from 5 to 15 percent in the Bx horizon

The Ap horizon is mostly 10YR hue, value of 4 or 5, and chroma of 2 or 3 The Bt horizon is mostly 10YR hue, value of 5, and chroma of 4 or 6; or 7.5YR hue, value of 5, and chroma of 6 The Bx horizon is mostly 10YR hue; value of 5; and chroma of 3, 4, or 6 The Bt and Bx horizons are commonly heavy silt loam, silty clay loam, or clay loam

Clarksburg soils are near the well drained Westmoreland and moderately well drained Guernsey soils, both of which are on uplands They differ from those soils in having a fragipan Also, they are less well drained than Westmoreland soils and are coarser textured in the lower part of the B horizon than Guernsey soils

**Clarksburg silt loam, 3 to 8 percent slopes** (ClB).—This soil is mottled slightly nearer the surface, but otherwise has the profile described as representative of the series. It is along drainageways and at the base of uplands. Seep spots occur in some places Included in mapping are small areas of Lindside and Melvin soils, a few small areas where the soil is somewhat poorly drained, a few areas where it is redder than is typical, a few where it is severely eroded, and a few areas where no fragipan has formed.

This Clarksburg soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is moderate in unprotected areas Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Drainage of seep spots is needed in some areas. Capability unit IIe-14; woodland subclass 2w

**Clarksburg silt loam, 8 to 15 percent slopes** (ClC).—This strongly sloping soil has the profile described as representative of the series It commonly occurs as narrow areas at the base of uplands and along natural drainageways. In places it is hummocky and dissected by small drainageways. Included in mapping are small areas of Westmoreland, Gilpin, and Upshur soils; a few small areas where the soil is well

drained; a few where it has a gray clayey layer about 2 feet below the surface; and a few where it is severely eroded.

The Clarksburg soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is severe in unprotected areas Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Diversions intercept runoff from the uplands and control soil and water losses. Areas that are hummocky and strongly dissected by drainageways are difficult to manage and should be maintained in permanent cover. Capability unit IIIe-14; woodland subclass 2w

**Clarksburg silt loam, 15 to 25 percent slopes** (ClD).—This soil is deeper over mottles, but otherwise has the profile described as representative of the series It is along the base of steep hillsides, on benches, and along drainageways that dissect the hillsides. In places it is dissected by small drainageways and slips are evident. Included in mapping are small areas of Westmoreland, Gilpin, and Upshur soils; a few small areas where the soil is redder or shallower than is typical, a few where it has a gray clayey layer about 2 feet below the surface and a few where it is well drained.

This Clarksburg soil has limited suitability for cultivated crops and is better suited to hay and pasture. The erosion hazard is severe in unprotected areas. Keeping tillage to a minimum, cultivating and stripcropping on the contour, including hay in the cropping system, maintaining natural drainageways in sod, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Diversions intercept runoff from the uplands and can help in controlling soil and water losses. Areas that are hummocky and strongly dissected by drainageways are difficult to manage and should be maintained in permanent cover. Capability unit IVe-9; woodland subclass 2w.

**Clarksburg silt loam, 15 to 25 percent slopes, severely eroded** (ClD3).—This soil generally has a higher content of coarse fragments, but otherwise has the profile described as representative of the series. It is mainly along drainageways and the base of steep hillsides. Erosion has removed most of the original surface layer, and the subsoil is exposed in places. Slips are evident and gullies have formed in some areas Included in mapping are small areas of Gilpin, Upshur, and Westmoreland soils; a few small areas where the soil is redder, shallower, or steeper than is typical, a few areas where it is well drained; and a few where it is moderately eroded

This Clarksburg soil is not suited to cultivated crops, but it is suited to pasture and trees. The erosion hazard is very severe in unprotected areas. Rotational grazing, mowing, and proper stocking are needed for control of runoff and erosion and also for preserving the fertility of the soil. Capability unit VIe-1; woodland subclass 2w.

## Cookport Series

The Cookport series consists of deep, moderately well drained soils on uplands These soils formed in acid material weathered from interbedded sandstone, siltstone, and shale They are mostly in the eastern part of Taylor County. Slopes range from 3 to 15 percent.

In a representative profile, the surface layer is brown silt loam 6 inches thick. The subsurface layer is yellowish-brown silt loam 8 inches thick. The yellowish-brown subsoil extends to a depth of 38 inches. The upper 7 inches is friable light clay loam; the next 5 inches is friable heavy sandy clay loam mottled with light gray and strong brown; and the lower 12 inches, a firm and brittle fragipan, is light sandy clay loam mottled with light gray and strong brown. The underlying material is grayish-brown heavy sandy loam. Sandstone is at a depth of 42 inches.

Cookport soils have moderate to low natural fertility. The available moisture capacity is moderate Permeability is moderate in the subsoil above the fragipan, but moderately slow to slow in the pan. A seasonal high water table is at a depth of 1½ to 2 feet

These soils are suited to crops commonly grown in the survey area Most of the acreage is cleared and used mainly for hay or pasture. The fragipan restricts roots and the movement of water through the soils This restriction affects the growth of a deep-rooted legume, such as alfalfa.

The seasonal high water table, the slope, the moderately slow to slow permeability, and the depth to bedrock are main limitations to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Cookport silt loam, 8 to 15 percent slopes, in a hayfield along State Route 50/12, 1 mile from its intersection with State Route 30, Taylor County:

Ap—0 to 6 inches, brown (10YR 4/3) silt loam; moderate, fine, granular structure; very friable; many roots; 5 percent coarse fragments; strongly acid; abrupt, smooth boundary.

A2—6 to 14 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, granular structure; very friable; many roots; 5 percent coarse fragments; very strongly acid; clear, wavy boundary.

B21t—14 to 21 inches, yellowish-brown (10YR 5/6) light clay loam; weak and moderate, medium, subangular blocky structure; friable; common roots; thin, discontinuous clay films; 8 percent coarse fragments; very strongly acid; clear, wavy boundary

B22t—21 to 26 inches, yellowish-brown (10YR 5/8) heavy sandy clay loam; few, medium, distinct, light-gray (N 7/0) and strong-brown (7.5YR 5/8) mottles; weak and moderate, medium, subangular blocky structure; friable; few roots; moderately thick, discontinuous clay films; 10 percent coarse fragments; very strongly acid; clear, wavy boundary.

Bx—26 to 38 inches, yellowish-brown (10YR 5/8) light sandy clay loam; many, medium and coarse, distinct, light-gray (N 7/0) and strong-brown (7 5YR 5/8) mottles; weak, very coarse, prismatic structure parting to weak, medium, subangular blocky; firm, brittle; thin, discontinuous clay films; 5 percent coarse fragments; very strongly acid; gradual, wavy boundary.

C—38 to 42 inches, grayish-brown (2.5Y 5/2) heavy sandy loam; many, medium, distinct, strong-brown (7 5YR 5/8) mottles; massive; very friable; 10 percent coarse fragments; very strongly acid; clear, wavy boundary.

R—42 to 46 inches, soft, weakly cemented, weathered sandstone.

Depth to bedrock ranges from 40 to 50 inches Thickness of the solum ranges from 28 to 40 inches Depth to low chroma mottles ranges from 16 to 24 inches Depth to the fragipan ranges from 18 to 27 inches. Unlimed soils are strongly acid to very strongly acid throughout. The content of coarse fragments ranges from 0 to 20 percent in the B horizon and from 5 to 60 percent in the C horizon.

The Ap horizon is mostly 10YR hue, value of 4, and chroma of 3 or 4; or value of 5 and chroma of 3. The Bt and Bx horizons are mostly 10YR hue; value of 4 or 5; and chroma of 4, 6, or 8. They are loam, sandy clay loam, or light clay loam. The C horizon is loam or sandy loam.

Cookport soils are near the well-drained Culleoka, Gilpin, and Dekalb soils In contrast with those soils they are deeper, are less well drained, and have a fragipan. Also, they have finer textured A and B horizons than Dekalb soils and are generally more acid than Culleoka soils

**Cookport silt loam, 3 to 8 percent slopes** (CoB) —This soil commonly has a slightly thicker surface layer and subsoil, but otherwise has the profile described as representative of the series. It is mostly on broad ridgetops. Included

in mapping are small areas of Culleoka and Gilpin soils, a few small areas where the soil is sandy loam throughout, a few where it is less sloping than is typical, a few where it is stony, and a few areas where the fragipan is less brittle.

This Cookport soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is moderate in unprotected areas. Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IIe-13; woodland subclass 2w.

**Cookport silt loam, 8 to 15 percent slopes** (CoC) — This strongly sloping soil has the profile described as representative of the series It is mainly on broad ridgetops Included in mapping are small areas of Culleoka, Gilpin, and Dekalb soils, a few small areas where the soil is sandy loam throughout; a few where it is stony on the surface and throughout; a few where it is severely eroded; and a few areas where the fragipan is less brittle than is typical.

This Cookport soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is severe in unprotected areas Cultivating and stripcropping on the contour, including hay in the cropping system, maintaining natural drainageways in sod, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IIIe-13; woodland subclass 2w.

## Culleoka Series

The Culleoka series consists of moderately deep, well-drained soils on uplands. These soils formed in lime-influenced material weathered from interbedded shale, siltstone, sandstone, and thin layers of limestone. They are common in the eastern part of Taylor County. Slopes range from 8 to 60 percent

In a representative profile, the surface layer is dark-brown silt loam about 8 inches thick. The strong-brown subsoil extends to a depth of 33 inches. The upper 6 inches is friable silt loam, the next 7 inches is friable heavy silt loam, and the lower 12 inches is friable to firm, shaly light silty clay loam The underlying material is yellowish-brown very shaly silty clay loam Siltstone and shale are at a depth of 38 inches

Culleoka soils have moderate to moderately high natural fertility. The available moisture capacity is moderate. Permeability is moderate in the subsoil

The less sloping Culleoka soils are suited to crops commonly grown in the survey area. Most of the less sloping areas have been cleared and are used mainly for hay or pasture. The more sloping areas are mostly wooded or pastured.

The limited depth to bedrock and the slope are the main limitations to consider in planning homesites and in locating roads or septic tank absorption fields. Soil slipping is a hazard on the steep and very steep soils.

Representative profile of Culleoka silt loam, 8 to 15 percent slopes, in a hayfield along the east side of an unimproved road, 0.6 mile south of Thornton Hill and U.S Route 50, Taylor County:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; very friable; many roots; 5 percent coarse fragments; neutral; clear, wavy boundary.

B1t—8 to 14 inches, strong-brown (7.5YR 5/6) silt loam; common ped faces of brown (7.5YR 5/4); moderate, fine, subangular blocky structure; friable; many roots; thin, discontinuous clay films, 10 percent coarse fragments; medium acid; clear, wavy boundary

B21t—14 to 21 inches, strong-brown (7 5YR 5/6) heavy silt loam; moderate, fine, subangular blocky structure; friable; many roots; thin, discontinuous clay films; 10 percent coarse fragments; medium acid, clear, wavy boundary

B22t—21 to 29 inches, strong-brown (7 5YR 5/6) shaly light silty clay loam; moderate, fine, subangular blocky structure; friable to firm; common roots; thin, nearly continuous clay films; 25 percent coarse fragments; strongly acid; abrupt, wavy boundary

B3t—29 to 33 inches, strong-brown (7 5YR 5/6) shaly light silty clay loam; few brownish-yellow (10YR 6/6) ped faces, weak, medium, subangular blocky structure; firm, few roots; thin, discontinuous clay films, 35 percent coarse fragments; strongly acid; clear, wavy boundary

C—33 to 38 inches, yellowish-brown (10YR 5/6) very shaly silty clay loam; massive; firm, few roots; 75 percent coarse fragments; medium acid, clear, wavy boundary

R—38 to 42 inches, reddish-brown siltstone and light olive-brown soft shale in layers 1 inch to 2 inches thick

Depth to bedrock is 20 to 40 inches. Thickness of the solum ranges from 20 to 37 inches Unlimed soils are medium acid to strongly acid in the B horizon and slightly acid to strongly acid in the C horizon. The content of coarse fragments ranges from 10 to 35 percent in the B horizon and from 25 to 80 percent in the C horizon.

The Ap horizon is mostly 10YR hue, value of 4 or 5, and chroma of 2 or 3 The B horizon is mostly 7 5YR hue, value of 4 or 5, and chroma of 4 or 6; or 10YR hue, value of 4 or 5, and chroma of 3, 4, or 6 It is silt loam, silty clay loam, or their shaly or channery analogs. The C horizon is loam, clay loam, or silty clay loam, or their shaly, very shaly, channery, or very channery analogs

Culleoka soils are near the well drained Dekalb and Gilpin soils and the moderately well drained Cookport and Wharton soils They are also near the moderately well drained Ernest soils, which are on foot slopes Culleoka soils are generally less acid than any of those soils They have a finer textured profile than Dekalb soils. They are shallower and better drained than Cookport, Wharton, and Ernest soils They also differ from Cookport and Ernest soils in not having a fragipan They are generally coarser textured in the lower part of the B horizon than Wharton soils

**Culleoka silt loam, 8 to 15 percent slopes** (CuC).— This strongly sloping soil has the profile described as representative of the series It is common on ridgetops and narrow benches. Included in mapping are small areas of Westmoreland, Gilpin, Wharton, and Dekalb soils and a few small areas where the soil is reddish and fine textured

This Culleoka soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is severe in unprotected areas Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth Capability unit IIIe-11; woodland subclass 2o

**Culleoka silt loam, 15 to 25 percent slopes** (CuD).— This soil is generally shallower over bedrock, but otherwise has the profile described as representative of the series. It is on the tops and sides of narrow ridges Included in mapping are small areas of Westmoreland, Gilpin, Dekalb, and Wharton soils and a few small areas where the soil is reddish and fine textured

This Culleoka soil has limited suitability for cultivated crops and is better suited to hay and pasture. The erosion hazard is severe in unprotected areas. Keeping tillage to a minimum, cultivating and stripcropping on the contour, including hay in the cropping system, maintaining natural drainageways in sod, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IVe-11, woodland subclass north aspect 2r, south aspect 3r.

**Culleoka silt loam, 25 to 35 percent slopes** (CuE) — This soil is generally shallower over bedrock, but otherwise has the profile described as representative of the series It is commonly on the sides of ridges Included in mapping are small areas of Westmoreland, Dekalb, and Gilpin soils and small narrow areas where the soil is reddish and fine textured.

This Culleoka soil is not suited to cultivated crops, but is suited to pasture and trees and is well suited to bluegrass. The erosion hazard is severe in unprotected areas Rotational grazing, mowing, and proper stocking rates are needed in controlling runoff and erosion and in maintaining fertility Capability unit VIe-1, woodland subclass north aspect 2r, south aspect 3r.

**Culleoka silt loam, 25 to 35 percent slopes, severely eroded** (CuE3).—This soil is shallower over bedrock and commonly has a larger number of coarse fragments on the surface, but otherwise has the profile described as representative of the series. It is commonly on the sides of ridges. Erosion has removed most of the original surface layer, and a few shallow gullies have formed Included in mapping are small areas of Westmoreland and Gilpin soils, a few small narrow areas where the soil is reddish and fine textured, and a few where it is less eroded than is typical.

Because slopes are steep and the erosion hazard is very severe in unprotected areas, this Culleoka soil has limited suitability for pasture and is better suited to trees. Rotational grazing, mowing, and proper stocking are needed in controlling runoff and erosion and in maintaining fertility in pastured areas The slope moderately limits the use of woodland equipment. Capability unit VIIe-1, woodland subclass north aspect 2r, south aspect 3r.

**Culleoka silt loam, 35 to 60 percent slopes, severely eroded** (CuF3).—This very steep soil is shallower over bedrock and commonly has a larger number of coarse fragments on the surface, but otherwise has the profile described as representative of the series. It commonly occurs along eroded valley walls. Erosion has removed most of the original surface layer, and a few shallow gullies have formed. Included in mapping are a few areas of Westmoreland and Gilpin soils; a few small narrow areas where the soil is reddish and fine textured, a few where it is very stony; and a few where it is less eroded, steeper, or shallower than is typical

Because slopes are very steep and the erosion hazard is very severe in unprotected areas, this Culleoka soil is best suited to trees. The slope severely limits the use of woodland equipment Capability unit VIIe-1; woodland subclass north aspect 2r, south aspect 3r

## Dekalb Series

The Dekalb series consists of moderately deep, well-drained soils on uplands. These soils formed in acid material weathered from sandstone and in places interbedded with siltstone and shale. They are mostly in the northeastern part of Taylor County. Slopes range from 8 to 70 percent.

In a representative profile in a wooded area, the surface layer is black sandy loam about an inch thick over 3 inches of grayish-brown sandy loam and about 7 inches of brown channery sandy loam. The yellowish-brown subsoil extends to a depth of 33 inches The upper 14 inches is friable channery sandy loam, and the lower 8 inches is very friable, very channery sandy loam Sandstone is at a depth of 33 inches

Dekalb soils have low natural fertility. The available moisture capacity is low to moderate. Permeability is moderately rapid in the subsoil

The nonstony Dekalb soils are suited to crops commonly grown in the survey area, but special management is needed to limit water losses. The extremely stony soils are best suited to trees. The acreage is mostly wooded or pastured, particularly where the soil is extremely stony

The limited depth to bedrock, the slope, and the stoniness are the main limitations to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Dekalb extremely stony sandy loam, very steep, in a wooded area along the north side of State Route 26, 1, 0 7 mile west of its intersection with State Route 26, Taylor County

A1—0 to 1 inch, black (10YR 2/1) sandy loam, weak, fine, granular structure; very friable; many roots; 10 percent coarse fragments; very strongly acid, clear, wavy boundary

A2—1 to 4 inches, grayish-brown (10YR 5, 2) sandy loam; weak, fine, granular structure, very friable; many roots, 12 percent coarse fragments; very strongly acid; grandual, smooth boundary

A3—4 to 11 inches, brown (10YR 5 3) channery sandy loam; weak, medium, granular structure; very friable, many roots; 20 percent coarse fragments; very strongly acid; gradual, smooth boundary.

B2—11 to 25 inches, yellowish-brown (10YR 5/6) channery sandy loam, weak, medium, subangular blocky structure, friable; common roots; 40 percent coarse fragments; very strongly acid; gradual, smooth boundary

B3—25 to 33 inches, yellowish-brown (10YR 5/8) very channery sandy loam, weak, medium, subangular blocky structure; very friable; few roots, 60 percent coarse fragments; very strongly acid; gradual, smooth boundary

R—33 inches, brown and gray fractured sandstone

Depth to bedrock ranges from 20 to 40 inches. Thickness of the solum ranges from 20 to 40 inches Unlimed soils are very strongly acid to strongly acid throughout. The content of coarse fragments commonly increases with increasing depth. It ranges from 10 to 60 percent in individual layers of the A and B horizons and makes up more than 35 percent of the soil mass

The A1 horizon is 10YR hue, value of 2, chroma of 1, or a value of 3 and chroma of 1 or 2. The A2 horizon is 10YR hue, value of 6, and chroma of 3 or 4, or value of 5 and chroma of 2. The B horizon is 10YR hue, value of 5, and chroma of 4, 6, or 8, or 7 5YR hue, value of 5, and chroma of 6 or 8 It is loam, sandy loam, or their channery or very channery analogs

Dekalb soils are near the well drained Culleoka and Gilpin soils, and the moderately well drained Cookport soils They are coarser textured than either Culleoka or Gilpin soils. They are better drained, less deep, and coarser textured in the A and B horizons than Cookport soils They do not have a fragipan, which is characteristic of Cookport soils They are generally more acid than Culleoka soils

**Dekalb sandy loam, 8 to 15 percent slopes** (DeC).—This soil commonly occurs as small areas on the tops and sides of ridges Included in mapping are small areas of Cookport, Gilpin, and Culleoka soils, a few small areas where the soil has an extremely stony surface, and a few where it is more sloping or less channery than is typical.

This Dekalb soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is severe in unprotected areas. Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion, in improving the moisture-holding capacity, and in maintaining fertility and good tilth. Capability unit IIIe-12; woodland subclass 4f.

**Dekalb extremely stony sandy loam, very steep** (DSF).—This soil has the profile described as representative of the series. It is in small areas on the tops and sides of ridges and is more variable than most other mapping units

in the survey area. Slopes are mostly 35 to 70 percent. Included in mapping are small areas of Gilpin and Culleoka soils and a few small areas where the soil is less stony, less sloping, or less channery than is typical

Because slopes are steep and very steep and the surface area is extremely stony, this Dekalb soil is best suited to trees. The slope and the large number of stones on the surface severely limit the use of woodland equipment Capability unit VIIs-4, woodland subclass north aspect 3x, south aspect 4x.

## Ernest Series

The Ernest series consists of deep, moderately well drained soils on foot slopes These soils formed in acid colluvial material that moved downslope mainly from Gilpin soils on uplands. They are only in Taylor County. Slopes range from 3 to 35 percent

In a representative profile, the surface layer is dark grayish-brown silt loam about 6 inches thick The subsoil extends to a depth of 48 inches. The upper 4 inches is light yellowish-brown, friable light silty clay loam; the next 18 inches is yellowish-brown, friable silty clay loam mottled with gray and strong brown below a depth of 18 inches, and the lower 20 inches, which is a firm and brittle fragipan, is light yellowish-brown, channery silty clay loam mottled with gray and strong brown. The underlying material, which is a firm and brittle fragipan, is mixed-gray and strong-brown, channery heavy silt loam that extends to a depth of 53 inches or more.

Ernest soils have moderate natural fertility. The available moisture capacity is moderate. Permeability is moderate in the subsoil above the fragipan and slow to moderately slow in the pan A seasonal high water table is at a depth of 1½ to 2 feet

The nonstony Ernest soils are suited to crops commonly grown in the survey area and are used mainly for hay and pasture. The very stony soils are pastured or wooded. The fragipan in the subsoil restricts roots and the movement of water through the soil. This restriction affects the growth of a deep-rooted legume, such as alfalfa.

Because these soils are on foot slopes, they are commonly used as building sites and road locations. The seasonal high water table, the slope, and the slow to moderately slow permeability, however, are limitations to be considered in planning homesites and in locating roads or septic tank absorption fields

Representative profile of Ernest silt loam, 8 to 15 percent slopes, at the edge of pasture along the west side of Cherry Run, 1.5 miles from its junction with Whiteday Creek, Taylor County:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; very friable; many roots; 5 percent coarse fragments; strongly acid; clear, smooth boundary

B1—6 to 10 inches, light yellowish-brown (10YR 6/4) light silty clay loam with brown (10YR 5/3) coatings; weak to moderate, medium, subangular blocky structure; friable; common roots; 5 percent coarse fragments; strongly acid; clear, wavy boundary.

B21t—10 to 18 inches, yellowish-brown (10YR 5/6) silty clay loam with few brown (10YR 5/3) coatings; moderate, fine and medium, subangular blocky structure, friable; common roots; thin, discontinuous clay films; 8 percent coarse fragments; strongly acid; clear, wavy boundary.

B22t—18 to 28 inches, yellowish-brown (10YR 5/6) silty clay loam; few, fine, distinct, gray (10YR 6/1) and strong-brown (7.5YR 5/8) mottles that increase in number with increasing depth; moderate, medium, subangular blocky structure; friable; few roots, thin, discontinuous clay films; 12 percent coarse fragments; very strongly acid, gradual, wavy boundary.

Bx—28 to 48 inches, light yellowish-brown (10YR 6/4) channery silty clay loam; many, medium, distinct, gray (10YR 6/1) and strong-brown (7 5YR 5/8) mottles, common, black and very dark-brown concretions, strong, very coarse, prismatic structure parting to weak, medium, subangular blocky and weak, thin platy; firm, brittle; 25 percent coarse fragments, very strongly acid; gradual, wavy boundary

Cx—48 to 53 inches, mixed gray (10YR 6/1) and strong-brown (7 5YR 5/8) channery heavy silt loam; massive; firm, brittle; 30 percent coarse fragments; very strongly acid

Depth to bedrock is generally greater than 4 feet Thickness of the solum ranges from 40 to 55 inches Depth to low chroma mottles ranges from 16 to 24 inches Depth to the fragipan ranges from 20 to 30 inches Unlimed soils are strongly acid to very strongly acid throughout The content of coarse fragments ranges from 5 to 20 percent in the B and Bt horizons and from 10 to 30 percent in the Bx and C horizons.

The Ap horizon is mostly 10YR hue, value of 4 or 5, and chroma of 2 or 3 The Bt and Bx horizons are generally 10YR hue, value of 5, and chroma of 3, 4, or 6, or value of 6 and chroma of 4, or 7 5YR hue, value of 4 or 5, and chroma of 4 or 6 They are silt loam or silty clay loam or their channery analogs In places the Bx horizon is clay loam or channery clay loam The C horizon is silt loam, or silty clay loam, or their channery analogs

Ernest soils are near the well-drained Gilpin and Culleoka soils, both of which are on uplands They are less well drained and deeper than those soils Also, they differ in having a fragipan They are generally more acid than Culleoka soils

**Ernest silt loam, 3 to 8 percent slopes** (EnB).—This soil is shallower over mottles, but otherwise has a profile similar to the one described as representative of the series. It is along drainageways and on lower foot slopes Seep spots are in some areas Included in mapping are small areas of Clarksburg soils, a few small areas where the soil has no fragipan, a few where it is poorly drained, and a few where it is redder and finer textured than is typical

This Ernest soil is suited to commonly grown cultivated crops and to hay and pasture The erosion hazard is moderate in unprotected areas Cultivating and striperopping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth Drainage of seep spots is needed in some areas Capability unit IIe-13, woodland subclass 2w.

**Ernest silt loam, 8 to 15 percent slopes** (EnC) —This strongly sloping soil has the profile described as representative of the series. It is around the heads of streams and in narrow areas along the lower hillsides. It is dissected by small drainageways in some places. Included in mapping are small areas of Clarksburg, Gilpin, and Upshur soils and a few small areas where the soil is well drained.

This Ernest soil is suited to commonly grown cultivated crops and to hay and pasture The erosion hazard is severe in unprotected areas Cultivating and striperopping on the contour, including hay in the cropping system, maintaining natural drainageways in sod, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Areas that are strongly dissected by drainageways are difficult to manage and are best maintained in permanent cover. Capability unit IIIe-13; woodland subclass 2w

**Ernest silt loam, 15 to 25 percent slopes** (EnD).—This soil is shallower over the fragipan, but otherwise has a profile similar to the one described as representative of the series. It is on the lower hillsides and in places occupies the lower third of the hillside. Included in mapping are small

areas of Clarksburg, Gilpin, and Upshur soils; a few small areas where the soil is well drained; a few where it is severely eroded, and a few where it is stony

This Ernest soil has limited suitability for cultivated crops and is better suited to hay and pasture The erosion hazard is severe in unprotected areas. Keeping tillage to a minimum, cultivating and stripcropping on the contour, including hay in the cropping system, maintaining natural drainageways in sod, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IVe-9; woodland subclass 2w.

**Ernest very stony silt loam, 3 to 15 percent slopes** (EsC).—Except for the very stony surface layer, this gently sloping to strongly sloping soil has a profile similar to the one described as representative of the series. It is mainly in the eastern half of Taylor County, along the lower hillsides, and around the heads of streams. Included in mapping are small areas of Clarksburg, Gilpin, and Upshur soils; a few small areas where the soil is nonstony, a few where it is extremely stony, a few where it is well drained, and a few where it is poorly drained

Because this Ernest soil is very stony, it is not suited to cultivated crops or hay It is suited to pasture Rotational grazing, mowing, and proper stocking help in controlling runoff and erosion and in maintaining fertility. Stones restrict the use of farm machinery. Capability unit VIs-2; woodland subclass 2w.

**Ernest very stony silt loam, 15 to 35 percent slopes** (EsD).—Except for the very stony surface layer, this soil has a profile similar to the one described as representative of the series. It is mostly near drainageways. Included in mapping are small areas of Clarksburg, Gilpin, and Upshur soils; a few small areas where the soil is nonstony; a few where it is extremely stony; and a few where it is well drained.

Because this Ernest soil is very stony and moderately steep to steep, it is not suited to cultivated crops or hay and has only limited suitability for pasture. It is better suited to trees The moderately steep and steep slopes limit the use of woodland equipment. Capability unit VIs-2; woodland subclass 2w.

## Faywood Series

The Faywood series consists of moderately deep, well-drained soils on uplands. These soils formed in limy material weathered from mainly interbedded shale, siltstone, and limestone. They are mostly in the northeastern part of Harrison County and in the northwestern part of Taylor County. Slopes range from 8 to 60 percent.

In a representative profile, the surface layer is brown silty clay loam about 5 inches thick. The firm subsoil extends to a depth of 23 inches. The upper 6 inches is strong-brown silty clay; the next 7 inches is dark yellowish-brown heavy silty clay; and the lower 5 inches is mixed dark-brown, strong brown, and grayish-brown silty clay. The underlying material is mixed brown and olive-gray silty clay that extends to siltstone at a depth of 30 inches.

Faywood soils have moderately high to high natural fertility. The available moisture capacity is moderate. Permeability is slow in the subsoil.

The less sloping Faywood soils are suited to crops commonly grown in the survey area. Most of the acreage is pastured. Steeper areas are idle or wooded. In places the underlying limestone is thick enough for quarrying.

The limited depth to bedrock, the slope, and the slow permeability are the main limitations to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Faywood silty clay loam, 35 to 60 percent slopes, in a pasture along Parnett Run, one-half mile north of State Route 24, Harrison County:

Ap—0 to 5 inches, brown (10YR 5/3) silty clay loam; moderate, fine, granular structure; friable; many roots; medium acid; gradual smooth boundary

B21t—5 to 11 inches, strong-brown (7.5YR 5/6) silty clay; moderate, fine, subangular blocky structure; firm; many roots; thin, discontinuous clay films; slightly acid; gradual, smooth boundary

B22t—11 to 18 inches, dark yellowish-brown (10YR 4/4) heavy silty clay; strong, fine and medium, subangular blocky structure; firm; common roots; moderately thick, continuous clay films, neutral, gradual, smooth boundary

B3—18 to 23 inches, mixed dark-brown (7.5YR 4/4), strong-brown (7.5YR 5/8), and grayish-brown (2.5Y 5/2) silty clay; moderate, medium and coarse, subangular blocky structure; firm; few roots; 10 percent coarse fragments, neutral; clear, wavy boundary.

C—23 to 30 inches, mixed brown (7.5YR 5/4) and olive-gray (5Y 5/2) silty clay; weak, medium, subangular blocky structure; firm; few roots; 10 percent coarse fragments; neutral; abrupt, wavy boundary

R—30 inches, olive-gray (5Y 4/2) weathered siltstone.

Depth to bedrock ranges from 20 to 40 inches. Thickness of the solum ranges from 18 to 30 inches. Unlimed soils are medium acid to neutral throughout The content of coarse fragments ranges from 0 to 15 percent in the A and B horizons and from 5 to 20 percent in the C horizon.

The Ap horizon is 10YR hue, value of 4 or 5, and chroma of 2 or 3. The B2 horizon is mostly 7.5YR hue, value of 4 or 5, and chroma of 4 or 6, or 10YR or 2.5Y hue, value of 4, and chroma of 3 or 4. The mixture of colors in the B3 and C horizons is produced not by the wetness of the soil, but by the color of the parent material The B and C horizons are silty clay or clay.

Faywood soils are near the well drained Westmoreland soils and the moderately well drained Guernsey soils They are shallower than either of those soils. They have a finer textured B horizon than Westmoreland soils and are better drained than Guernsey soils

**Faywood silty clay loam, 8 to 15 percent slopes** (FaC).—Except for a thicker surface layer and subsoil, this soil has a profile similar to the one described as representative of the series. It is mostly on narrow benches and in saddles of ridgetops. Included in mapping are a few small areas of Guernsey, Westmoreland, Gilpin, and Upshur soils. Outcrops of limestone bedrock are few to common.

This Faywood soil has limited suitability for cultivated crops and is better suited to hay and pasture. The erosion hazard is severe in unprotected areas. Keeping tillage to a minimum, cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IVe-30; woodland subclass 3c.

**Faywood silty clay loam, 15 to 25 percent slopes** (FaD).—Except for a thicker surface layer and subsoil, this soil has a profile similar to the one described as representative of the series It is most common on knobs and in saddles of ridgetops. Included in mapping are small areas of Westmoreland, Gilpin, Upshur, and Guernsey soils, a few small areas where the soil is shallower over bedrock than is typical; and a few areas where it is severely eroded. Outcrops of limestone bedrock are few to common.

This Faywood soil is not suited to cultivated crops, but is suited to pasture and trees. Bluegrass grows well. The erosion hazard is severe in unprotected areas. Rotational

grazing, mowing, and proper stocking are needed in controlling erosion and runoff and in maintaining fertility. Capability unit VIe-1; woodland subclass 3c.

**Faywood silty clay loam, 25 to 35 percent slopes** (FaE).—This soil is slightly deeper over bedrock, but otherwise has the profile described as representative of the series. It is mostly along hillsides. Included in mapping are small areas of Westmoreland, Gilpin, and Upshur soils; a few small areas where the soil is severely eroded, and a few where it is shallower over bedrock than is typical.

Because this Faywood soil has steep slopes and a severe erosion hazard in unprotected areas, its suitability for pasture is limited It is better suited to trees. Rotational grazing, mowing, and proper stocking are needed in controlling erosion and runoff and in maintaining fertility. The steep slopes moderately limit the use of woodland equipment. Capability unit VIIe-1; woodland subclass 3c

**Faywood silty clay loam, 35 to 60 percent slopes** (FaF) —This very steep soil has the profile described as representative of the series. It is mostly on hillsides. Included in mapping are small areas of Westmoreland, Gilpin, and Upshur soils, a few small areas where the soil is severely eroded; and a few where it is shallower over bedrock than is typical. Outcrop of limestone bedrock is common.

Because this Faywood soil has very steep slopes and a severe erosion hazard in unprotected areas, it is best suited to trees Slope severely limits the use of woodland equipment Capability unit VIIe-1; woodland subclass 3c.

## Fluvaquents, Overwash

Fluvaquents, overwash (FO) is on flood plains. It is deep, nearly level, and poorly drained and very poorly drained. It formed in stratified recent alluvium washed from soils on uplands and still more recent sediments eroded from strip mines. These sediments commonly fill stream channels in Harrison and Taylor Counties and cause ponding.

Fluvaquents, overwash, has a surface deposit, 1 to 3 feet thick, of medium-textured, channery material washed from strip mine spoil. Below this is moderately fine textured to moderately coarse textured soil material and in places strata of gravel Most areas are medium to very strongly acid Colors range mostly from black to grayish brown in the surface layer and dark gray to yellowish brown in the underlying layers. High and low chroma mottles are evident throughout. Included in mapping are small areas of Melvin and Lindside soils that have not received significant amounts of sediment from the strip mines and a few small areas where the soil is too acid to support vegetation.

Fluvaquents, overwash, is not suited to commonly grown cultivated crops or to hay or pasture Cattail is the common plant cover.

The high water table and the flood hazard are the main limitations to be considered in planning homesites and in locating roads or septic tank absorption fields. Capability unit VIIIw-1; woodland subclass is variable

## Gilpin Series

The Gilpin series consists of moderately deep, well-drained soils on uplands These soils formed in acid material weathered from interbedded shale, siltstone, and sandstone. They are common throughout the two counties. In the western part of Harrison County they are commonly mapped with Upshur soils. Slopes range from 3 to 70 percent.

In a representative profile in a wooded area, the surface layer is very dark grayish-brown silt loam 2 inches thick. The subsurface layer is dark grayish-brown silt loam about 3 inches thick. The yellowish-brown subsoil extends to a depth of 22 inches. The upper 7 inches is firm light silty clay loam, and the lower 10 inches is firm, channery light silty clay loam. The underlying material is yellowish-brown, very channery silt loam that extends to siltstone and sandstone at a depth of 32 inches.

Gilpin soils have low to moderate natural fertility The available moisture capacity is moderate to low. Permeability is moderate in the subsoil.

The less sloping Gilpin soils are suited to crops commonly grown in the survey area and are used mainly for hay or pasture. The steeper soils and the very stony soils are mostly wooded or pastured.

The limited depth to bedrock and the slope are the main limitations to be considered in planning homesites and in locating roads or septic tank absorption fields. The hazard of slippage on the steeper Gilpin soils should also be considered, particularly where these soils are mapped with Upshur soils.

Representative profile of Gilpin silt loam, 35 to 60 percent slopes, in a wooded area along Tenmile Creek, 1½ miles south of Marshville, Harrison County.

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; loose, many roots; 5 percent coarse fragments; strongly acid; abrupt, smooth boundary

A2—2 to 5 inches, dark grayish-brown (10YR 4/2) silt loam, weak, fine, subangular blocky structure; friable; many roots; 5 percent coarse fragments, strongly acid; clear, smooth boundary.

B21t—5 to 12 inches, yellowish-brown (10YR 5/8) light silty clay loam; moderate, fine, subangular blocky structure; firm; many roots; thin, discontinuous clay films; 5 percent coarse fragments, strongly acid; gradual, smooth boundary.

B22t—12 to 22 inches, yellowish-brown (10YR 5/4) channery light silty clay loam; moderate, fine, subangular blocky structure; firm; common roots; thin, nearly continuous clay films; 40 percent coarse fragments; strongly acid; gradual, smooth boundary

C—22 to 32 inches, yellowish-brown (10YR 5/4) very channery silt loam; massive; firm; 90 percent coarse fragments; strongly acid; gradual, wavy boundary.

R—32 inches, siltstone and fine-grained sandstone

Depth to bedrock ranges from 20 to 40 inches Thickness of the solum ranges from 20 to 35 inches Unlimed soils are strongly acid to very strongly acid throughout The content of coarse fragments ranges from 5 to 40 percent in individual layers of the B horizon and from 40 to 90 percent in the C horizon.

The Ap horizon is mostly 10YR hue, value of 3 or 4, and chroma of 2; or value of 3 and chroma of 3 The B horizon is mostly 10YR hue, value of 5, and chroma of 4, 6, or 8; or 7.5YR hue, value of 5, and chroma of 6 or 8. It is silt loam, or light silty clay loam, or their channery or shaly analogs. The C horizon is shaly, very shaly, channery, or very channery loam or silt loam

Gilpin soils are near the well drained Culleoka, Dekalb, Rayne, Upshur, and Westmoreland soils and the moderately well drained Cookport and Wharton soils. They are also near the well drained Vandalia and moderately well drained Ernest soils, which are on foot slopes. They are finer textured than Dekalb soils. They are coarser textured, less red, and generally more acid than Upshur or Vandalia soils They are shallower and better drained than Cookport and Ernest soils. Also, they differ from those soils in not having a fragipan They are shallower and generally more acid than Westmoreland soils They are shallower and better drained and have a coarser textured lower B horizon than Wharton soils. They are generally more acid than Culleoka soils and shallower than Rayne and Vandalia soils.

**Gilpin silt loam, 3 to 8 percent slopes** (GlB).—Except for a thicker surface layer and subsoil, this soil has the pro-

file described as representative of the series. It is common on ridgetops. Included in mapping are a few small areas of Rayne, Wharton, and Cookport soils

This Gilpin soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is moderate in unprotected areas. Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IIe-10, woodland subclass 2o.

**Gilpin silt loam, 8 to 15 percent slopes** (GlC).—Except for a thicker surface layer and subsoil, this soil has the profile described as representative of the series. It is mostly on ridgetops and benches. Included in mapping are a few small areas of Rayne, Wharton, Dekalb, Cookport, and Upshur soils and a few small areas where the soil is severely eroded

This Gilpin soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is severe in unprotected areas. Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IIIe-10; woodland subclass 2o.

**Gilpin silt loam, 15 to 25 percent slopes** (GlD).—Except for a slightly thicker surface layer and subsoil, this soil has the profile described as representative of the series. It is mostly on ridgetops and benches. Included in mapping are a few small areas of Wharton and Upshur soils, a few small areas where the soil is severely eroded, a few where it is very stony, and a few where it is more sandy than is typical

This Gilpin soil has limited suitability for cultivated crops and is better suited to hay and pasture. The erosion hazard is severe in unprotected areas. Keeping tillage to a minimum, cultivating and stripcropping on the contour, including hay in the cropping system, maintaining natural drainageways in sod, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IVe-3; woodland subclass north aspect 2r, south aspect 3r.

**Gilpin silt loam, 25 to 35 percent slopes** (GlE).—Except for a slightly thicker surface layer and subsoil, this soil has the profile described as representative of the series. It is most common on hillsides. Included in mapping are a few small areas of Upshur and Dekalb soils, a few small areas where the soil is severely eroded, a few where it is very stony, and a few areas where the subsoil is more channery than is typical.

This Gilpin soil is not suited to cultivated crops, but is suited to pasture and trees. The erosion hazard is severe in unprotected areas. Rotational grazing, mowing, and proper stocking are needed in controlling erosion and runoff and in maintaining fertility. Capability unit VIe-2; woodland subclass north aspect 2r, south aspect 3r.

**Gilpin silt loam, 35 to 60 percent slopes** (GlF).—This very steep soil has the profile described as representative of the series. It is along hillsides, breaks between bench levels, and sides of ridges. Included in mapping are a few small areas of Upshur soils, a few small areas where the soil on narrow ridgetops is shallower over bedrock than is typical, a few areas where the soil is severely eroded, a few where it is very stony, and a few where the subsoil is more channery than is typical.

Because this Gilpin soil has very steep slopes and a severe erosion hazard in unprotected areas, its suitability for pasture is limited and its management as pasture is difficult. It is better suited to trees. The slope severely limits the use of woodland equipment. Capability unit VIIe-2; woodland subclass north aspect 2r, south aspect 3r

**Gilpin very stony silt loam, 3 to 15 percent slopes** (GsC).—Except for a very stony surface layer and a greater number of stones in the subsoil, this soil has a profile similar to the one described as representative of the series. It is most common on benches and ridgetops. Included in mapping are a few small areas of Dekalb, Cookport, Rayne, Upshur, and Culleoka soils and a few small areas where the soil is nonstony.

Because the surface layer is very stony, this Gilpin soil is not suited to cultivated crops or hay and has only limited suitability for pasture. Stones restrict the use of farm machinery. The soil is better suited to trees. Capability unit VIIs-2; woodland subclass 2o

**Gilpin very stony silt loam, 15 to 35 percent slopes** (GsE).—Except for a very stony surface layer and stones throughout, this soil has a profile similar to the one described as representative of the series. It is on hillsides, benches, and the sides of ridges. Included in mapping are a few small areas of Dekalb, Cookport, Rayne, Upshur, and Culleoka soils; a few small areas where the soil is nonstony, and a few where it is shallower over bedrock than is typical.

Because this Gilpin soil has a very stony surface layer and is moderately steep and steep, it is not suited to cultivated crops or hay and has only limited suitability for pasture. It is better suited to trees. Slope limits the use of woodland equipment. Capability unit VIIs-2; woodland subclass north aspect 2r, south aspect 3r.

**Gilpin very stony silt loam, very steep** (GTF).—Except for a very stony surface and stones throughout, this soil has a profile similar to the one described as representative of the series. It is on the sides of ridges and on hills and is more variable than most other mapping units in the survey area. Slopes are mostly 35 to 70 percent. Included in mapping are a few areas of Dekalb and Culleoka soils, a few small areas where the soil is severely eroded, and a few where it is nonstony. Rock crops out in places.

Because this Gilpin soil has a very stony surface layer and is steep and very steep, it is best suited to trees. Slope severely limits the use of woodland equipment. Capability unit VIIs-2; woodland subclass north aspect 2r, south aspect 3r.

**Gilpin-Upshur complex, 8 to 15 percent slopes** (GuC).—This mapping unit is about 45 percent Gilpin silt loam and 45 percent Upshur silty clay loam. Except for a thicker surface layer and subsoil, the Gilpin soil has a profile similar to the one described as representative of the Gilpin series. The Upshur soil is less eroded, is generally deeper over bedrock, and has a coarser textured surface layer, but otherwise has a profile similar to the one described as representative of the Upshur series. These strongly sloping soils are common on benches and ridgetops. Included in mapping are a few small areas of Rayne and Wharton soils, a few areas where the soil is severely eroded, and a few where it is less sloping than is typical.

This mapping unit is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is severe in unprotected areas. Cultivating and stripcropping on the contour, including hay in the cropping system, maintaining natural drainageways in sod, and returning crop

residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IIIe-15; woodland subclass 3c.

**Gilpin-Upshur complex, 8 to 15 percent slopes, severely eroded** (GuC3).—This mapping unit is about 45 percent Gilpin silt loam and 45 percent Upshur silty clay. The Gilpin soil is more eroded and is commonly deeper over bedrock, but otherwise has a profile similar to the one described as representative of the Gilpin series. The Upshur soil is slightly deeper over bedrock, but otherwise has a profile similar to the one described as representative of the Upshur series. These soils are common on benches and ridgetops. Erosion has removed most of the original surface layer, and the subsoil is exposed in places. Shallow gullies and slips are evident Included in mapping are a few small areas of Rayne and Wharton soils and a few small areas where the soil is less sloping or less eroded than is typical.

This mapping unit has limited suitability for cultivated crops and is better suited to hay and pasture. The erosion hazard is very severe in unprotected areas. Keeping tillage to a minimum, cultivating and stripcropping on the contour, including hay in the cropping system, maintaining natural drainageways in sod, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth Capability unit IVe-15; woodland subclass 3c

**Gilpin-Upshur complex, 15 to 25 percent slopes** (GuD) —This mapping unit is about 45 percent Gilpin silt loam and 45 percent Upshur silty clay loam Except for a thicker surface layer and subsoil, the Gilpin soil has a profile similar to the one described as representative of the Gilpin series. The Upshur soil is less eroded, is slightly deeper over bedrock, and has a coarser textured surface layer, but otherwise has a profile similar to the one described as representative of the Upshur series. These soils are common on benches and ridgetops. Slips are evident in places Included in mapping are a few small areas of Rayne and Wharton soils; a few areas where the soil is stony; and a few where it is severely eroded, particularly in the Zesing area of Harrison County.

This mapping unit has limited suitability for cultivated crops and is better suited to hay and pasture. The erosion hazard is severe in unprotected areas. Keeping tillage to a minimum, cultivating and stripcropping on the contour, including hay in the cropping system, maintaining natural drainageways in sod, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IVe-15; woodland subclass north aspect 2c, south aspect 3c

**Gilpin-Upshur complex, 15 to 25 percent slopes, severely eroded** (GuD3).—This mapping unit is about 45 percent Gilpin silt loam and 45 percent is Upshur silty clay. The Gilpin soil is more eroded and commonly has a more channery surface layer, but otherwise has a profile similar to the one described as representative of the Gilpin series. The Upshur soil has the profile described as representative of the Upshur series. These soils are common on benches and ridgetops. Erosion has removed most of the original surface layer, and the subsoil is exposed in places. Shallow gullies and slips are common in some areas. Included in mapping are a few small areas of Wharton soils, a few areas where the soil is stony, and a few where it is less eroded than is typical.

This mapping unit is not suited to cultivated crops, but is suited to pasture and trees Bluegrass grows well. The erosion hazard is very severe in unprotected areas. Rotational grazing, mowing, and proper stocking are needed in controlling erosion and runoff and in maintaining fertility. Capability unit VIe-3; woodland subclass north aspect 2c, south aspect 3c.

**Gilpin-Upshur complex, 25 to 35 percent slopes** (GuE) —This mapping unit is about 70 percent Gilpin silt loam and about 20 percent Upshur silty clay loam. The Gilpin soil is slightly deeper over bedrock, but otherwise has a profile similar to the one described as representative of the Gilpin series. The Upshur soil is less eroded, is shallower over bedrock, and has a coarser textured surface layer, but otherwise has a profile similar to the one described as representative of the Upshur series. These soils are common on narrow ridgetops, benches, and hillsides Slips are evident in places. Included in mapping are a few small areas where the subsoil is very channery, a few where the soil is severely eroded, and a few where it is very stony

This mapping unit is not suited to cultivated crops, but is suited to pasture and trees Bluegrass grows well The erosion hazard is severe in unprotected areas. Rotational grazing, mowing, and proper stocking are needed in controlling erosion and runoff and in maintaining fertility Capability unit VIe-3; woodland subclass north aspect 2c, south aspect 3c

**Gilpin-Upshur complex, 25 to 35 percent slopes, severely eroded** (GuE3).—This mapping unit is about 70 percent Gilpin silt loam and 20 percent Upshur silty clay. The Gilpin soil is more eroded and commonly has a more channery surface layer, but otherwise has a profile similar to the one described as representative of the Gilpin series. The Upshur soil is typically shallower over bedrock, but otherwise has a profile similar to the one described as representative of the Upshur series. These soils are common on narrow ridgetops, benches, and hillsides. Erosion has removed most of the original surface layer, and the subsoil is exposed in places Shallow gullies and slips are evident in some areas. Included in mapping are a few areas where the subsoil is very channery and a few where the soil is very stony

Because slopes are steep and the erosion hazard is very severe in unprotected areas, suitability for pasture is limited. The soils are better suited to trees. Rotational grazing, mowing, and proper stocking are needed in controlling erosion and runoff and in maintaining fertility. Slope moderately limits the use of woodland equipment. Capability unit VIIe-1; woodland subclass north aspect 2c, south aspect 3c.

**Gilpin-Upshur complex, 35 to 70 percent slopes, severely eroded** (GuF3).—This mapping unit is about 70 percent Gilpin silt loam and 20 percent Upshur silty clay. The Gilpin soil is more eroded and slightly shallower over bedrock, but otherwise has a profile similar to the one described as representative of the Gilpin series. The Upshur soil is commonly shallower over bedrock, but otherwise has a profile similar to the one described as representative of the Upshur series. These soils are most common along breaks beneath ridgetops, between benches, and on hillsides. Erosion has removed most of the original surface layer, and the subsoil is exposed in places Shallow gullies and slips are evident in some areas. Included in mapping are a few small areas where the subsoil is very channery and a few where the soil is very stony

Because slopes are very steep and the erosion hazard is very severe in unprotected areas, these soils are best suited to trees. Slope severely limits the use of woodland equip-

ment. Capability unit VIIe-1, woodland subclass north aspect 2c, south aspect 3c

## Guernsey Series

The Guernsey series consists of deep, moderately well drained soils on uplands. These soils formed in lime-influenced material weathered from interbedded shale, siltstone, sandstone, and thin layers of limestone. They are mostly in the eastern two-thirds of Harrison County and the western third of Taylor County. Slopes range from 3 to 25 percent.

In a representative profile, the surface layer is dark-brown silt loam about 8 inches thick. The subsoil extends to a depth of 42 inches. The upper 4 inches is yellowish-brown, friable light silty clay loam, the next 6 inches is yellowish-brown, firm heavy silty clay loam, the next 16 inches is yellowish-brown, firm silty clay mottled with gray, light gray, and strong brown, and the lower 8 inches is mixed yellowish-brown, light-gray, and strong-brown, firm shaly clay. The underlying material is mixed gray and strong-brown shaly silty clay that extends to a depth of 60 inches or more.

Guernsey soils have moderate to moderately high natural fertility. The available moisture capacity is moderate to high. Permeability is moderate in the upper part of the subsoil and moderately slow to slow in the middle and lower parts A seasonal high water table is at a depth of 1 1/2 to 2 feet.

Guernsey soils are suited to crops commonly grown in the survey area. They are mostly cleared and used for hay or pasture. The seasonal high water table limits the growth of a deep-rooted legume, such as alfalfa A large area has been strip mined for coal

The seasonal high water table, the slope, the moderately slow to slow permeability, the moderate to high shrink-swell potential, and the hazard of slippage are limitations to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Guernsey silt loam, 8 to 15 percent slopes, in a pasture, at the Harrison-Taylor County line on the divide between Corbin Branch and Anns Run.

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; very friable; many roots; 5 percent coarse fragments; medium acid; clear, wavy boundary

B1—8 to 12 inches, yellowish-brown (10YR 5/4) light silty clay loam; weak and moderate, medium, subangular blocky structure, friable; many roots; dark-brown films on a few ped faces; 5 percent coarse fragments; strongly acid; clear, wavy boundary.

B21t—12 to 18 inches, yellowish-brown (10YR 5/6) heavy silty clay loam; moderate, medium, subangular blocky structure; firm; common roots; thin, continuous clay films; 5 percent coarse fragments; strongly acid; clear, wavy boundary.

B22t—18 to 24 inches, yellowish-brown (10YR 5/6) silty clay; common, fine, distinct, gray (10YR 6/1) and strong-brown (7.5YR 5/8) mottles; moderate, medium, subangular blocky structure; firm; common roots; moderately thick, continuous clay films; 5 percent coarse fragments; strongly acid; clear wavy boundary.

B23t—24 to 34 inches, yellowish-brown (10YR 5/6) silty clay; many, medium, distinct, light-gray (10YR 7/1) and strong-brown (7.5YR 5/8) mottles; weak and moderate, medium and coarse, subangular blocky structure; firm; few roots; thin, discontinuous clay films; few black coatings; 10 percent coarse fragments; strongly acid; clear, wavy boundary

B3t—34 to 42 inches, mixed yellowish-brown (10YR 5/4), light-gray (10YR 7/1), and strong-brown (7 5YR 5/8) shaly clay; weak, coarse, prismatic structure parting to weak, medium, subangular blocky; firm, thin, discontinuous clay films, few black coatings, 20 percent coarse fragments; medium acid; clear, wavy boundary

C—42 to 60 inches, mixed-gray (10YR 6/1) and strong-brown (7 5YR 5/8) shaly silty clay; massive; firm; 35 percent coarse fragments; neutral becoming moderately alkaline with increasing depth

Depth to bedrock ranges from 40 to 72 inches Thickness of the solum ranges from 40 to 55 inches Depth of low chroma mottles ranges from 18 to 24 inches Unlimed soils are strongly acid to medium acid in the upper part of the B horizon and medium acid to slightly acid in the lower part The content of coarse fragments ranges from 0 to 20 percent in the B horizon and can be as much as 35 percent in the C horizon

The Ap horizon is mostly 10YR hue, value of 4, and chroma of 2 or 3 The B horizon is 10YR hue, value of 4 or 5, and chroma of 4 or 6; or 7 5YR hue, value of 4, and chroma of 4 It is silty clay loam, silty clay, or clay The C horizon is silty clay, or clay, or their shaly analogs

Guernsey soils are near the well drained Westmoreland and Faywood soils and the moderately well drained Clarksburg soils on foot slopes They are less well drained than Westmoreland or Faywood soils. They have a finer textured lower B horizon than Westmoreland or Clarksburg soils and are deeper than Faywood soils Also, they differ from Clarksburg soils in not having a fragipan

**Guernsey silt loam, 3 to 8 percent slopes** (GyB).—Except for a thicker surface layer and subsoil, this soil has the profile described as representative of the series. It is mostly on ridgetops and benches Seep spots are common in places. Included in mapping are a few small areas of Westmoreland, Faywood, and Clarksburg soils and a few small areas where the soil is severely eroded.

This Guernsey soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is moderate in unprotected areas Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Drainage of seep spots is needed in some areas. Capability unit IIe-14; woodland subclass 2w

**Guernsey silt loam, 8 to 15 percent slopes** (GyC).—This strongly sloping soil has the profile described as representative of the series. It is on ridgetops and benches. Drainageways and seep spots are common in places. Included in mapping are a few small areas of Westmoreland, Clarksburg, Upshur, and Gilpin soils and a few small areas where the soil is severely eroded

This Guernsey soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is severe in unprotected areas Cultivating and stripcropping on the contour, including hay in the cropping system, maintaining natural drainageways in sod, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Areas where the soil is strongly dissected by drainageways are difficult to manage and should be maintained in permanent cover Capability unit IIIe-14, woodland subclass 2w

**Guernsey silt loam, 15 to 25 percent slopes** (GyD).—Except for a thinner surface layer and subsoil, this soil has the profile described as representative of the series. It is mostly on benches. Drainageways are common in places. Included in mapping are a few small areas of Clarksburg, Westmoreland, Upshur, and Gilpin soils and a few small areas where the soil is steeper than is typical.

This Guernsey soil has limited suitability for cultivated crops and is better suited to hay and pasture. The erosion hazard is severe in unprotected areas. Keeping tillage to a minimum, stripcropping on the contour, including hay in

the cropping system, maintaining natural drainageways in sod, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IVe-9, woodland subclass 2w.

**Guernsey silt loam, 15 to 25 percent slopes, severely eroded** (GyD3).—This soil is more eroded and commonly has a thinner surface layer and subsoil, but otherwise has a profile similar to the one described as representative of the series. It is most common on benches. Erosion has removed most of the original surface layer, and the subsoil is exposed in places. Shallow gullies and drainageways are common in some areas. Included in mapping are a few small areas of Westmoreland, Clarksburg, and Upshur soils.

This Guernsey soil is not suited to cultivated crops, but is suited to pasture and trees. Bluegrass grows well. The erosion hazard is very severe in unprotected areas. Rotational grazing, mowing, and proper stocking are needed in controlling erosion and runoff and in maintaining fertility. Capability unit VIe-1; woodland subclass 2w.

## Hackers Series

The Hackers series consists of deep, well-drained soils on high bottom land. These soils formed in lime-influenced alluvial material washed from soils underlain by shale, siltstone, and sandstone. They are mostly along the West Fork River and Ten Mile Creek in Harrison County. They are rarely flooded. Slopes are mostly less than 3 percent.

In a representative profile, the surface layer is dark-brown silt loam about 10 inches thick. The friable subsoil extends to a depth of 50 inches. The upper 7 inches is dark-brown silt loam, the next 17 inches is reddish-brown light silty clay loam, and the lower 16 inches is dark-brown silt loam. The underlying material is dark-brown heavy fine sandy loam stratified with fine sandy loam and silt loam. It extends to a depth of 70 inches or more.

Hackers soils have moderate to moderately high natural fertility. The available moisture capacity is high. Permeability is moderate in the subsoil.

Hackers soils are easy to work and well suited to crops commonly grown in the survey area. Most of the acreage is cleared and used mainly for cultivated crops or hay.

The flood hazard is the main limitation to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Hackers silt loam, in a pasture on the east side of the West Fork River, 1 mile south of West Milford, Harrison County:

Ap—0 to 10 inches, dark-brown (7.5YR 4/2) silt loam; moderate, medium, granular structure; very friable; many roots; medium acid; clear, wavy boundary.

B1t—10 to 17 inches, dark-brown (7.5YR 4/4) silt loam with common brown (7.5YR 4/2) ped faces; moderate, medium, subangular blocky structure; friable; common roots; thin, discontinuous clay films; strongly acid; clear, wavy boundary.

B2t—17 to 34 inches, reddish-brown (5YR 4/4) light silty clay loam, moderate, medium, subangular blocky structure; friable; few roots; thin, discontinuous clay films; strongly acid; gradual, wavy boundary.

B3t—34 to 50 inches, dark-brown (7.5YR 4/4) silt loam with few red (2.5YR 4/6) ped faces; weak, coarse, subangular blocky structure; friable; few roots; thin, discontinuous clay films; common fine mica flakes; strongly acid; gradual, wavy boundary.

C—50 to 70 inches, dark-brown (7.5YR 4/4), heavy fine sandy loam stratified with layers of fine sandy loam and silt loam; few, faint, strong-brown (7.5YR 5/8) mottles; massive; friable; medium acid.

Depth to bedrock is generally more than 6 feet. Thickness of the solum ranges from 35 to 60 inches. Unlimed soils are medium acid to strongly acid in the B horizon. The gravel content ranges from 0 to 15 percent in the lower part of the B horizon and in the C horizon.

The Ap horizon is 7.5YR hue, value of 3 or 4, and chroma of 2. The B horizon is mostly 7.5YR and 5YR hue, value of 4, and chroma of 3 or 4. Some ped faces commonly are 2.5YR hue, value of 4, and chroma of 6. At least one subhorizon of the B horizon is 5YR hue or redder. It is silt loam or light silty clay loam. The C horizon is dominantly fine sandy loam or silt loam commonly stratified with loam and silty clay loam.

Hackers soils are near the well drained Nolin soils, the moderately well drained Lindside soils, and the poorly drained Melvin soils. They are flooded less frequently than any of those soils. Their B horizon is redder in some parts than the B horizon of Nolin and Lindside soils. They are better drained than Lindside and Melvin soils and are redder than Melvin soils.

**Hackers silt loam** (Ha).—This nearly level soil is on high flood plains and is rarely flooded. Included in mapping are a few small areas of Chavies soils and a few small areas where the soil is less red than is typical.

This Hackers soil is well suited to commonly grown cultivated crops and to hay and pasture. Cultivated crops can be grown year after year if the soil is protected by a cover crop. Working the cover crop into the soil helps in maintaining fertility and good tilth. Capability unit I-6, woodland subclass 1o.

## Lindside Series

The Lindside series consists of deep, moderately well drained soils on flood plains. These soils formed in lime-influenced alluvial material washed from soils underlain by shale, siltstone, and thin layers of limestone. They are along streams in Harrison County and in the western part of Taylor County. They are subject to flooding. Slopes are mostly less than 3 percent.

In a representative profile, the surface layer is dark grayish-brown silt loam about 10 inches thick. The friable subsoil extends to a depth of 40 inches or more. The upper 12 inches is dark-brown heavy silt loam, and the lower 18 inches is dark-brown light silty clay loam mottled with strong brown and gray. The underlying material is mixed grayish-brown, strong-brown, and dark-brown silt loam stratified with thin layers of gravelly fine sandy loam. It extends to a depth of 60 inches or more.

Lindside soils have moderate to moderately high natural fertility. The available moisture capacity is high. Permeability is moderate in the subsoil. A seasonal high water table is at a depth of 1 1/2 to 2 feet.

Lindside soils are easy to work and are suited to crops commonly grown in the survey area. Alfalfa and other deep-rooted legumes are likely to be short-lived on these moderately wet soils. Drainage helps in some areas.

The seasonal high water table and the flood hazard are the main limitations to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Lindside silt loam, in a hayfield near Lost Creek, north of I-79, Harrison County:

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

B21t—10 to 22 inches, dark-brown (7.5YR 4/4) heavy silt loam; moderate, fine, subangular blocky structure; friable; common roots; medium acid; gradual, smooth boundary.

B22—22 to 40 inches, dark-brown (7.5YR 4/4) light silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/8) and gray (10YR 6/1) mottles; weak, coarse, subangular blocky

structure; friable; few roots; medium acid, gradual, wavy boundary.

C—40 to 60 inches, mixed grayish-brown (10YR 5/2), strong-brown (7.5YR 5/8), and dark-brown (7.5YR 4/4) silt loam stratified with thin layers of gravelly fine sandy loam; massive; friable; few manganese concretions; slightly acid.

Depth to bedrock is generally more than 5 feet. Thickness of the solum ranges from 30 to 50 inches. Low chroma mottles are at a depth of 15 to 24 inches. Unlimed soils are medium acid to slightly acid throughout.

The Ap horizon is 10YR or 7.5YR hue, value of 4 or 5, and chroma of 2 or 3. The B horizon is 10YR or 7.5YR hue, value of 4 or 5, and chroma of 3 or 4. It is silt loam or light silty clay loam. The C horizon is stratified light silty clay loam, silt loam, loam, and fine sandy loam. In places it contains a few pebbles.

Lindside soils are near the well-drained Nolin and Hackers soils and the poorly drained Melvin soils. They are less well drained than Nolin and Hackers soils. They are flooded more frequently and are less red in some parts of the B horizon than Hackers soils. They are better drained than Melvin soils.

**Lindside silt loam** (Ln).—This nearly level soil is subject to flooding. Included in mapping are a few small areas of Nolin and Melvin soils, a few small areas where the soil is reddish, and a few areas where the surface layer is loam or fine sandy loam.

This Lindside soil is suited to commonly grown cultivated crops and to hay and pasture. It can be cropped yearly, but it needs the protection of a cover crop. Working the cover crop into the soil helps in maintaining tilth and fertility. Crops are damaged occasionally by floodwater. Small wet areas need drainage before desirable crops can grow. Capability unit IIw-7; woodland subclass 1w.

## Melvin Series

The Melvin series consists of deep, poorly drained soils on flood plains. These soils formed in lime-influenced alluvial material washed from soils underlain by shale, siltstone, sandstone, and thin layers of limestone. They are along streams in Harrison County and in the western part of Taylor County. They are subject to flooding. Slopes are mostly less than 3 percent.

In a representative profile, the surface layer is about 6 inches of gray silt loam mottled with dark brown. The subsoil extends to a depth of 24 inches. It is gray, firm heavy silt loam mottled with strong brown and dark brown. The underlying material extends to a depth of 52 inches or more. The upper 22 inches is gray silt loam mottled with dark yellowish brown, and the lower 6 inches or more is stratified silt loam, loam, and fine sandy loam.

Melvin soils have moderate to moderately high natural fertility. The available moisture capacity is high. Permeability is moderately slow in the subsoil. A seasonal high water table is at or near the surface.

Drainage is needed before desirable crops can grow. If the soil is drained, the commonly grown cultivated crops and hay and pasture plants that can tolerate some wetness can be grown. A deep-rooted legume, such as alfalfa, is likely to be short lived in these wet soils. The acreage is mostly cleared. Drained areas are used mainly for hay or pasture, and undrained areas are mostly idle.

The seasonal high water table, the moderately slow permeability, and the flood hazard are the main limitations to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Melvin silt loam, in a hayfield near the intersection of State Routes 23/9 and 23/3, Harrison County

Ap—0 to 6 inches, gray (10YR 5/1) silt loam; many, medium, distinct, dark-brown (7.5YR 4/4) mottles; moderate, medium, granular structure; friable; many roots, medium acid; abrupt, smooth boundary.

B2g—6 to 24 inches, gray (10YR 5/1) heavy silt loam; many, medium, distinct, strong-brown (7.5YR 5/8) and dark-brown (7.5YR 4/4) mottles; weak, medium, subangular blocky structure, firm; few roots; medium acid; gradual, smooth boundary.

Cg—24 to 46 inches, gray (10YR 5/1) silt loam; many, coarse, dark yellowish-brown (10YR 4/4) mottles; massive; firm, slightly sticky; slightly acid; clear, smooth boundary.

IIC—46 to 52 inches, gray (10YR 5/1) stratified silt loam, loam, and fine sandy loam; many, coarse, dark yellowish-brown (10YR 4/4) mottles; massive; firm; slightly acid.

Depth to bedrock is generally greater than 4 feet. Thickness of the solum ranges from 20 to 30 inches. Unlimed soils are medium acid in the upper part, are slightly acid to neutral in the lower part, and generally become less acid with increasing depth.

The Ap horizon is mostly 10YR hue, value of 4 or 5, and chroma of 1 or 2; or 2.5Y hue, value of 4 or 5, and chroma of 2. The B horizon is 10YR or 2.5Y hue; value of 5, 6, or 7; and chroma of 1 or 2. It is silt loam or light silty clay loam. The C horizon is silt loam or light silty clay loam that is stratified with sand, silt, and clay below a depth of 40 inches. In places the C horizon contains a few pebbles.

Melvin soils are near the well drained Hackers and Nolin soils and the moderately well drained Lindside soils. They are less well drained than any of those soils. They are less red and are flooded more frequently than Hackers soils.

**Melvin silt loam** (Me).—This nearly level soil is subject to flooding. Surface drainage is generally poor, and water can pond for long periods in some areas. Included in mapping are a few small areas of Lindside soils and a few small areas where the soil is more acid, finer textured, or redder than is typical.

If adequately drained, this Melvin soil has limited suitability for cultivated crops. Hay and pasture plants that are a mixture of water-tolerant grasses and legumes are better suited than other commonly grown crops. A delay in pasturing or tilling this wet soil until it is reasonably dry and firm helps in avoiding compaction and loss of tilth. Capability unit IIIw-1; woodland subclass 1w.

## Monongahela Series

The Monongahela series consists of deep, moderately well drained soils on stream terraces. These soils formed in old acid alluvial material washed from soils underlain by shale, siltstone, and sandstone. They are on high stream terraces mainly along the West Fork River and Elk and Simpson Creeks in Harrison County. Slopes range from 3 to 15 percent.

In a representative profile, the surface layer is dark-brown silt loam about 8 inches thick. The subsoil extends to a depth of 56 inches. The upper 14 inches is yellowish-brown, friable heavy silt loam; the next 4 inches is yellowish-brown, friable heavy silt loam mottled with light brownish gray and strong brown; and the lower 30 inches is a very firm and brittle fragipan. The pan is yellowish-brown silt loam mottled with light brownish gray and strong brown in the upper 24 inches and strong-brown clay loam mottled with light brownish gray and strong brown in the lower 6 inches. The underlying material is mixed strong-brown, light yellowish-brown, and yellowish-brown fine sandy loam that extends to a depth of 61 inches or more.

Monongahela soils have low to moderate natural fertility. The available moisture capacity is moderate. Permeability is moderate in the subsoil above the fragipan and slow in the pan. A seasonal high water table is at a depth of 1½ to 2½ feet.

Monongahela soils are easily worked and are suited to crops commonly grown in the survey area. Most of the acreage is cleared and used mainly for hay or pasture The fragipan restricts roots and the movement of water through the soil. This restriction affects the growth of a deep-rooted legume, such as alfalfa.

Because these soils are on stream terraces, many are used as building sites The seasonal high water table, the slow permeability, and the slope are the main limitations to be considered in planning homesites and in locating roads or septic tank absorption fields

Representative profile of Monongahela silt loam, 3 to 8 percent slopes, at a new housing development, west of the Bridgeport city limits, on State Route 24, Harrison County:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, granular and moderate, thin, platy structure; very friable; many roots; strongly acid; clear, smooth boundary.

B21t—8 to 22 inches, yellowish-brown (10YR 5/6) heavy silt loam; weak, fine and medium, subangular blocky structure; friable; common roots; thin, discontinuous clay films; strongly acid; gradual, smooth boundary

B22t—22 to 26 inches, yellowish-brown (10YR 5/6) heavy silt loam; common, medium, distinct, light brownish-gray (10YR 6/2) and strong-brown (7 5YR 5/7) mottles; weak, fine, subangular blocky structure; friable; few roots; thin, discontinuous clay films; strongly acid; gradual, smooth boundary

Bx1—26 to 50 inches, yellowish-brown (10YR 5/6) silt loam; many, coarse, distinct, light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/8) mottles, weak, very coarse, prismatic structure; very firm, brittle; moderately thick, discontinuous clay films; porous manganese concretions very prominent at 48 inches; strongly acid; clear, wavy boundary.

Bx2—50 to 56 inches, strong-brown (7 5YR 5/6) clay loam; few, coarse, distinct, light brownish-gray (10YR 6/2) and strong-brown (7 5YR 5/8) mottles; weak, very coarse, prismatic structure parting to weak, thick, platy; very firm, brittle, thin, discontinuous clay films, strongly acid; clear, wavy boundary

C—56 to 61 inches, mixed strong-brown (7 5YR 5/8), light yellowish-brown (2 5Y 6/4), and yellowish-brown (10YR 5/6) fine sandy loam; massive; firm; 10 percent coarse fragments; strongly acid

Depth to bedrock ranges from 40 to 72 inches. Thickness of the solum ranges from 40 to 60 inches. Depth to low chroma mottles ranges from 20 to 30 inches. Depth to the fragipan ranges from 18 to 30 inches. Unlimed soils are strongly acid to very strongly acid throughout. The content of rounded coarse fragments ranges from 0 to 15 percent in the A and B2t horizons, from 0 to 25 in the Bx horizon, and from 10 to 40 in the C horizon.

The Ap horizon is mostly 10YR hue, value of 4, and chroma of 2 or 3. The Bt and Bx horizons are mostly 10YR hue, value of 5, and chroma of 4, 6, or 8; or 7.5YR hue, value of 5, and chroma of 2, 4, or 6. They are silt loam, silty clay loam, clay loam, or loam The C horizon is fine sandy loam, loam, or clay loam.

Monongahela soils are near the well drained Allegheny soils, the moderately well drained Zoar soils, and the somewhat poorly drained Tygart soils. They differ from those soils in having a fragipan. They are less well drained than Allegheny soils, have a coarser textured B horizon than Zoar and Tygart soils, and are better drained than Tygart soils

**Monongahela silt loam, 3 to 8 percent slopes** (MoB). —This gently sloping soil has the profile described as representative of the series It is on broad stream terraces. Seep spots are in some areas. Included in mapping are a few small areas of Tygart soils, a few small areas where the soil is nearly level, a few where the surface layer is loam or fine sandy loam, and a few where the upper part of the subsoil is more sandy or the lower part more clayey than is typical

This Monongahela soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is moderate in unprotected areas. Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Drainage of seep spots is needed in some areas. Capability unit IIe-13; woodland subclass 3w

**Monongahela silt loam, 8 to 15 percent slopes** (MoC) —Except for a thinner surface layer and subsoil, this soil has a profile similar to the one described as representative of the series. It is commonly on the outer edges of terraces and in areas dissected by drainageways Included in mapping are a few small areas of Allegheny soils, a few small areas where the surface layer is loam or fine sandy loam, and a few where the upper part of the subsoil is more sandy or the lower part more clayey than is typical

This Monongahela soil is suited to commonly grown cultivated crops and to hay and pasture. Erosion is severe in unprotected areas. Cultivating and stripcropping on the contour, maintaining natural drainageways in sod, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IIIe-13, woodland subclass 3w.

## Nolin Series

The Nolin series consists of deep, well-drained soils on flood plains. These soils formed in lime-influenced alluvial material washed from soils underlain by shale, siltstone, sandstone, and thin layers of limestone. They are only in Harrison County mostly along the larger streams. They are subject to flooding Slopes are mostly less than 3 percent.

In a representative profile, the surface layer is dark grayish-brown silt loam about 8 inches thick The subsoil extends to a depth of about 45 inches It is dark-brown friable silt loam. The underlying material is dark-brown and brown stratified silt loam and fine sandy loam that extends to a depth of 66 inches or more

Nolin soils have moderate to moderately high natural fertility. The available moisture capacity is high. Permeability is moderate in the subsoil.

Nolin soils are easy to work and are well suited to crops commonly grown in the survey area. Most of the acreage is cleared and used mainly for cultivated crops or hay.

The flood hazard is the main limitation to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Nolin silt loam, in a field at the intersection of State Routes 57 and 20 near Elk Creek, Harrison County·

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; many roots; medium acid; abrupt, smooth boundary

B21—8 to 32 inches, dark-brown (7.5YR 4/4) silt loam; weak, fine, subangular blocky structure; friable; common roots; medium acid; gradual, smooth boundary

B22—32 to 45 inches, dark-brown (7 5YR 4/4) silt loam; moderate, medium, subangular blocky structure; friable; few roots; medium acid; clear, smooth boundary

C—45 to 66 inches, dark-brown (7 5YR 4/4) and brown (7 5YR 5/4), stratified silt loam and fine sandy loam, massive; friable and very friable; slightly acid

Depth to bedrock is generally greater than 5 feet Thickness of the solum ranges from 40 to 60 inches Unlimed soils are medium acid to slightly acid throughout.

The Ap horizon is 10YR hue, value of 4, and chroma of 2 or 3. The B horizon is 10YR hue, value of 4 or 5, and chroma of 3; or 10YR or 7.5YR hue, value of 4, and chroma of 4 It is silt loam or light silty clay loam The C horizon is stratified silt loam and fine sandy loam. In places it contains a few pebbles.

Nolin soils are near the well drained Hackers soils, the moderately well drained Lindside soils, and the poorly drained Melvin soils. They are less red in some parts of the B horizon and are flooded more frequently than Hackers soils. They are better drained than Lindside and Melvin soils.

**Nolin silt loam** (No).—This nearly level soil is subject to flooding. Streambank erosion is a hazard in some areas. Included in mapping are a few small areas of Lindside soils and a few small areas where the soil is coarser textured or redder than is typical.

This soil is well suited to commonly grown cultivated crops and to hay and pasture. It can be cropped year after year, but needs the protection of a cover crop. Working the cover crop into the soil maintains tilth and fertility. Crops are damaged occasionally by flooding. Capability unit IIw-6, woodland subclass 1o.

## Philo Series

The Philo series consists of deep, moderately well drained soils on flood plains. These soils formed in acid alluvial material washed from soils underlain by acid sandstone, siltstone, and shale. They are along streams mostly in the western third of Harrison County and the northern and eastern two-thirds of Taylor County. They are subject to flooding. Slopes are mostly less than 3 percent.

In a representative profile, the surface layer is dark grayish-brown silt loam about 7 inches thick. The dark yellowish-brown, friable subsoil extends to a depth of 22 inches. The upper 5 inches is silt loam, and the lower 10 inches is fine sandy loam. The underlying material extends to a depth of 50 inches or more. The upper 6 inches is dark yellowish-brown fine sandy loam mottled with light gray, and the lower 22 inches or more is brown gravelly sandy loam mottled with light gray and strong brown.

Philo soils have moderate natural fertility. The available moisture capacity is moderate to high. Permeability is moderate in the subsoil. A seasonal high water table is at a depth of 1½ to 2 feet.

Philo soils are easily worked and are suited to crops commonly grown in the survey area. Most of the acreage is cleared and used for hay or cultivated crops. Alfalfa and other deep-rooted legumes are likely to be short lived on these moderately wet soils.

The seasonal high water table and the flood hazard are the main limitations to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Philo silt loam, in a hayfield near the mouth of Little Rock Camp Run, Harrison County:

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

B1—7 to 12 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, subangular blocky structure, friable; common roots; medium acid; gradual, smooth boundary.

B2—12 to 22 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, fine, subangular blocky structure; friable; common roots; medium acid; clear, smooth boundary.

C1—22 to 28 inches, dark yellowish-brown (10YR 4/4) fine sandy loam with thin layers of loamy sand; common, medium, faint, light-gray (10YR 6/1) mottles; single grained; friable, few roots; medium acid; gradual, wavy boundary.

IIC2—28 to 50 inches, brown (7.5YR 4/4) gravelly sandy loam; many, medium, distinct, light-gray (10YR 6/1) and strong-brown (7.5YR 5/8) mottles; massive; friable; 20 percent gravel; medium acid.

Depth to bedrock is generally more than 4 feet. Thickness of the solum ranges from 20 to 40 inches. Depth to low chroma mottles ranges from 15 to 24 inches. Unlimed soils are medium acid to strongly acid throughout. The content of coarse fragments ranges from 0 to 20 percent in the B horizon and from 0 to 25 percent in the C horizon.

The Ap horizon is mainly 10YR hue, value of 3 or 4, and chroma of 2 or 3. The B horizon is 10YR hue, value of 4, and chroma of 3 or 4; or 7.5YR hue, value of 4 or 5, and chroma of 4. It is mainly silt loam or fine sandy loam. The C horizon ranges from silt loam to sand.

Philo soils are near the well-drained Chavies and Pope soils and the poorly drained Atkins soils. They are less well drained than Chavies and Pope soils, but are better drained than Atkins soils. They have a finer textured Ap horizon and are flooded more frequently than Chavies soils and have a coarser textured B horizon than Atkins soils.

**Philo silt loam** (Ph).—This nearly level soil is along streams and is subject to flooding. Included in mapping are a few small areas of Atkins and Pope soils, a few small areas where the soil is gravelly, and a few where it is redder than is typical.

This Philo soil is suited to commonly grown cultivated crops and to hay and pasture. It can be cropped year after year, but needs the protection of a cover crop. Working the cover crop into the soil helps in maintaining tilth and fertility. Crops are damaged occasionally by floodwater. Small wet areas need to be drained before desirable crops can grow. Capability unit IIw-7, woodland subclass 1w.

## Pope Series

The Pope series consists of deep, well-drained soils on flood plains. These soils formed in acid alluvial material washed from soils underlain by sandstone, siltstone, and shale. They are in the western half of Harrison County mainly along Ten Mile Creek and West Fork River and in the northern and eastern parts of Taylor County. They are subject to flooding. Slopes are mostly less than 3 percent.

In a representative profile, the surface layer is dark grayish-brown silt loam about 9 inches thick. The subsoil extends to a depth of 48 inches. The upper 18 inches is brown, very friable to friable fine sandy loam, and the lower 21 inches is dark-brown, friable fine sandy loam that has small pockets of sandy clay loam. The underlying material is yellowish-brown, stratified loamy sand and fine sandy loam. It extends to a depth of 60 inches or more.

Pope soils have moderate natural fertility. The available moisture capacity is moderate to high. Permeability is moderate to moderately rapid in the subsoil.

Pope soils are easily worked and are suited to crops commonly grown in the survey area. Most of the acreage is cleared and used mainly for cultivated crops or hay.

The flood hazard is the main limitation to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Pope silt loam, in a hayfield along the northwest side of Wickwire Creek, one-half mile upstream from the Tygart Valley River, Taylor County:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; many roots; strongly acid; clear, wavy boundary.

B21—9 to 27 inches, brown (7.5YR 5/4) fine sandy loam; weak, fine, subangular blocky structure; very friable to friable; common roots; strongly acid; gradual, wavy boundary.

B22—27 to 48 inches, dark-brown (7.5YR 4/4) fine sandy loam with small pockets of sandy clay loam, moderate, medium, subangular blocky structure; friable; few roots, strongly acid; clear, wavy boundary.

C—48 to 60 inches, yellowish-brown (10YR 5/6) stratified loamy sand and fine sandy loam; few, fine, distinct, very pale brown

(10YR 7/3) and strong-brown (7.5YR 5/8) mottles; single grained; very friable to loose; 10 percent cobbles and gravel; strongly acid

Depth to bedrock is generally greater than 5 feet Thickness of the solum ranges from 30 to 50 inches Unlimed soils are strongly acid to very strongly acid throughout. The content of coarse fragments is as much as 20 percent in the A and B horizons and 30 percent in the C horizon.

The Ap horizon is mainly 10YR hue, value of 4 or 5, and chroma of 2 or 3 The B horizon is 10YR hue, value of 4 or 5, and chroma of 3 or 4; or 7.5YR hue, value of 4 or 5, and chroma of 4 or 6 It is silt loam, loam, or fine sandy loam. The C horizon is stratified fine sandy loam, loamy sand, or loam, or their gravelly or cobbly analogs

Pope soils are near the well drained Chavies soils, the moderately well drained Philo soils, and the poorly drained Atkins soils. They have a finer textured Ap horizon and are flooded more frequently than Chavies soils, are better drained than Atkins and Philo soils, and have a coarser textured B horizon than Atkins soils.

**Pope silt loam** (Po).—This nearly level soil is subject to flooding. Included in mapping are a few small areas of Philo soils, a few small areas where the soil is gravelly, and a few where the surface layer is loam or fine sandy loam.

This Pope soil is suited to commonly grown cultivated crops and to hay and pasture. It can be cropped year after year, but needs the protection of a cover crop, which helps in maintaining tilth and fertility. Crops are damaged occasionally by flooding Capability unit IIw-6, woodland subclass 2o.

## Rayne Series

The Rayne series consists of deep, well-drained soils on uplands These soils formed in acid material weathered from interbedded shale, siltstone and sandstone. They are mostly in the northern and eastern two-thirds of Taylor County. Slopes range from 3 to 15 percent.

In a representative profile, the surface layer is dark grayish-brown silt loam about 8 inches thick The yellowish-brown subsoil extends to a depth of 40 inches. The upper 6 inches is friable silt loam; the next 18 inches is friable heavy silt loam and silty clay loam, and the lower 8 inches is friable channery silt loam. The underlying material is light yellowish-brown channery silt loam. It extends to siltstone at a depth of 44 inches

Rayne soils have moderate to low natural fertility. The available moisture capacity is moderate to high. Permeability is moderate in the subsoil.

Rayne soils are easily worked and are suited to crops commonly grown in the survey area. Most of the acreage is cleared and used mainly for hay or pasture.

The slope and the limited depth over bedrock are main limitations to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Rayne silt loam, 3 to 8 percent slopes, in a hayfield along the east side of State Route 10, about 750 feet south of U. S Route 250, Taylor County:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; very friable; many roots; 5 percent coarse fragments; strongly acid; abrupt, smooth boundary

B1—8 to 14 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, subangular blocky structure; friable; many roots; 5 percent coarse fragments; strongly acid; clear, wavy boundary.

B21t—14 to 21 inches, yellowish-brown (10YR 5/8) heavy silt loam; moderate, fine and medium, subangular blocky structure; friable; common roots; thin, discontinuous clay films; 8 percent coarse fragments; strongly acid; clear, wavy boundary

B22t—21 to 32 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; friable, common roots; moderately thick, nearly continuous clay films; 15 percent coarse fragments; strongly acid; clear, wavy boundary.

B23t—32 to 40 inches, yellowish-brown (10YR 5/4) channery silt loam; moderate, fine, subangular blocky structure; friable; few roots; thin, discontinuous clay films; 25 percent coarse fragments; strongly acid; clear, wavy boundary.

C—40 to 44 inches, light yellowish-brown (10YR 6/4) channery silt loam; massive; friable, few roots; 35 percent coarse fragments; strongly acid; clear, wavy boundary

R—44 inches, brownish-yellow (10YR 6/8) siltstone.

Depth to bedrock is generally more than 3½ feet Thickness of the solum ranges from 36 to 50 inches. Unlimed soils are strongly acid to very strongly acid throughout The content of coarse fragments ranges from 5 to 35 percent in the B horizon and is as much as 90 percent in the C horizon.

The Ap horizon is 10YR hue, value of 3 or 4, and chroma of 2; or value of 4 and chroma of 3 The B horizon is 10YR or 7 5YR hue; value of 5; and chroma of 4, 6, or 8 It is silty clay loam, silt loam, or loam, or their channery or shaly analogs. The C horizon is loam, silt loam, or silty clay loam, or their channery, shaly, very channery, or very shaly analogs

Rayne soils are near the well-drained Gilpin soils. They are deeper than those soils

**Rayne silt loam, 3 to 8 percent slopes** (RaB).—This gently sloping soil has the profile described as representative of the series. It is mostly on broad ridgetops. Included in mapping are a few small areas of Gilpin and Cookport soils

This Rayne soil is suited to commonly grown cultivated crops and to hay and pasture The erosion hazard is moderate in unprotected areas Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IIe-4; woodland subclass 2o.

**Rayne silt loam, 8 to 15 percent slopes** (RaC).—Except for a thinner surface layer and subsoil, this soil has a profile similar to the one described as representative of the series. It is mostly on ridgetops. Included in mapping are a few small areas of Gilpin and Cookport soils.

This Rayne soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is severe in unprotected areas. Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IIIe-4; woodland subclass 2o

## Strip Mines

Strip mines (Sm) is leveled and unleveled spoil that has resulted from surface mining. This spoil is a mixture of soil, rock, and coal fragments It is mostly near Westmoreland and Guernsey soils. Included in the areas mapped are the exposed rocks of the high wall. Slopes range from 0 to 65 percent.

The amount of coarse material on the surface and in the spoil varies. The texture of the spoil varies, but is dominantly loamy. The acidity also varies and reaches toxic levels in places. The weight of the spoil material creates a slip hazard on soils below the mined area.

If well managed, leveled areas can support pasture. They are generally too stony for tilled crops. Unleveled areas and outer slopes can be planted to trees The suitability for growing various kinds of vegetation and for other uses can be determined at each site. No capability unit or woodland classification.

## Tygart Series

The Tygart series consists of deep, somewhat poorly drained soils on terraces. These soils formed in old acid alluvial material washed from soils underlain by shale, siltstone, and sandstone They are mostly in Harrison County, but a few are in Taylor County. Slopes are generally less than 3 percent

In a representative profile, the surface layer is grayish-brown silt loam about 8 inches thick The subsoil extends to a depth of about 42 inches The upper 5 inches is pale-brown, friable light silty clay loam mottled with strong brown; the next 7 inches is yellowish-brown, firm heavy silty clay loam mottled with light gray and strong brown, the next 12 inches is light-gray, firm heavy silty clay loam mottled with strong brown; the lower 10 inches is light-gray, firm light silty clay mottled with strong brown The underlying material is light-gray silty clay that extends to a depth of 54 inches or more.

Tygart soils have moderate to moderately low natural fertility. The available moisture capacity is moderate to high. Permeability is moderate in the upper part of the subsoil and slow in the middle and lower parts. The seasonal high water table is within a depth of 1 foot.

Tygart soils have limited suitability for crops commonly grown in the survey area Most of the acreage is cleared and used mainly for hay and pasture Hay and pasture plants that tolerate some wetness can be grown. A deep-rooted legume, such as alfalfa, is likely to be short lived on this wet soil. Drainage is commonly needed before desirable crops can be grown.

The seasonal high water table and the slow permeability are the main limitations to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Tygart silt loam, along the north side of State Route 23/1 about 1 mile south of its intersection with State Route 23/9, Harrison County:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; weak, fine, granular structure; friable; many roots; strongly acid; abrupt, smooth boundary.

B1—8 to 13 inches, pale-brown (10YR 6/3) light silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; friable; few roots; strongly acid; clear, wavy boundary.

B21tg—13 to 20 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; many, coarse, distinct, light-gray (10YR 7/1) and strong-brown (7 5YR 5/6) mottles; common very pale brown (10YR 7/3) coatings on ped faces; moderate, medium, subangular blocky structure; firm; few roots; thin, continuous, grayish-brown (10YR 5/2) clay films; strongly acid; clear, wavy boundary.

B22tg—20 to 32 inches, light-gray (10YR 7/1) heavy silty clay loam; many, coarse, prominent, strong-brown (7 5YR 5/8) mottles; few very pale brown (10YR 7/3) coatings on ped faces; moderate, medium and coarse, subangular blocky structure; firm; few roots; thin, continuous, grayish-brown (10YR 5/2) clay films; strongly acid; clear, wavy boundary,

B3tg—32 to 42 inches, light-gray (10YR 7/1) light silty clay; many. coarse, strong-brown (7 5YR 5/8) mottles; weak, fine and medium, subangular blocky structure; firm; thin, discontinuous, grayish-brown (10YR 5/2) clay films; strongly acid; gradual, wavy boundary

C—42 to 54 inches, light-gray (10YR 7/1) silty clay; many, coarse, distinct, strong-brown (7.5YR 5/8) mottles; massive; firm; strongly acid.

Depth to bedrock is more than 5 feet Thickness of the solum ranges from 35 to 55 inches Depth to low chroma mottles ranges from 9 to 16 inches. Unlimed soils are medium acid or strongly acid in the upper part and strongly acid to very strongly acid in the lower part

The Ap horizon is 10YR hue, value of 4 or 5, and chroma of 2, or value of 4 and chroma of 3. The upper part of the B horizon is 10YR hue, value of 5 or 6, and chroma of 3; or value of 5 and chroma of 4. The lower part is 10YR or 2 5Y hue, value of 6 or 7, and chroma of 1 or 2 It is heavy silty clay loam or silty clay The C horizon is heavy silty clay loam, silty clay, or clay

Tygart soils are near the well drained Allegheny soils and the moderately well drained Monongahela and Zoar soils. They are less well drained than any of those soils They have a finer textured B horizon than Allegheny and Monongahela soils Also, they differ from Monongahela soils in not having a fragipan.

**Tygart silt loam** (Tg).—This nearly level soil is on terraces and benches It has poor surface drainage, and water ponds in some low areas for moderate periods Included in mapping are a few small areas of Monongahela and Zoar soils; a few small areas where the soil is poorly drained; and a few where a firm to very firm, brittle loamy layer is about 2 feet below the surface.

If adequately drained, this Tygart soil is suited to commonly grown cultivated crops and to hay and pasture. It is better suited to a mixture of water-tolerant grasses and legumes than to other commonly grown crops A delay in pasturing or tilling this soil until it is reasonably dry and firm helps in avoiding compaction and loss of tilth. Capability unit IIIw-5, woodland subclass 2w.

## Udifluvents and Fluvaquents

Udifluvents and Fluvaquents (UF) is on flood plains mainly along small streams in Harrison and Taylor Counties. The soils are deep, nearly level and gently sloping, excessively drained to very poorly drained, and extremely variable within short distances They formed in stratified recent alluvium washed from soils on uplands Most areas still receive fresh sediments. Included in mapping are small areas of Atkins, Lindside, Melvin, Philo, and Pope soils

The texture of these soils ranges from moderately fine to moderately coarse. Gravel strata are common. The color ranges from black to light yellowish brown in the surface layer and from dark gray to reddish yellow in the underlying layers. In places mottles are evident throughout the soil material.

Udifluvents and Fluvaquents are not suited to commonly grown cultivated crops, but are suited to trees, pasture, and water-tolerant pasture plants In places drainage is needed before desirable plants can be grown. A delay in pasturing until the wetter areas are reasonably dry and firm helps in avoiding compaction and loss of tilth.

The high water table and the flood hazard are the main limitations to be considered in planning homesites and in locating roads or septic tank absorption fields. Capability unit Vw-1; woodland subclass 2w.

## Upshur Series

The Upshur series consists of moderately deep or deep, well-drained soils on uplands. These soils formed in lime-influenced material weathered from red clay shale that contained some carbonates. They are mostly in the western part of Harrison County and are commonly mapped with Gilpin soils. Slopes range from 8 to 70 percent.

In a representative profile, the surface layer is reddish-brown silty clay about 4 inches thick. The subsoil extends to a depth of 32 inches. The upper 9 inches is dark reddish-brown, firm silty clay; and the lower 19 inches is weak-red, firm, sticky and plastic clay. The underlying material is

dark reddish-brown very shaly silty clay loam that extends to shale at a depth of 38 inches

Upshur soils have moderately high natural fertility The available moisture capacity is moderate to high. Permeability is moderately slow in the upper part of the subsoil and slow in the middle and lower parts

Upshur soils have limited suitability for crops commonly grown in the survey area Cleared areas are mainly used for hay or pasture. The soils are difficult to work and become cloddy if worked when they are too wet.

The limited depth to bedrock, the slope, the slow permeability, the high shrink-swell potential, and the hazard of slippage are limitations to be considered in planning homesites and in locating roads or septic tank absorption fields

Representative profile of Upshur silty clay, in an area of the Gilpin-Upshur complex, 15 to 25 percent slopes, severely eroded, in an idle field along State Route 48, near the Harrison-Doddridge County line:

Ap—0 to 4 inches, reddish-brown (5YR 4/3) silty clay; moderate, very fine, subangular blocky structure; firm; many roots; slightly acid, gradual, smooth boundary

B21t—4 to 13 inches, dark reddish-brown (2 5YR 3/4) silty clay; strong, medium, subangular blocky structure; firm; many roots; thin, continuous clay films; slightly acid; gradual, smooth boundary.

B22t—13 to 24 inches, weak-red (10R 4/4) clay; strong, fine, subangular blocky structure; firm, sticky and plastic; common roots; moderately thick, continuous clay films; slightly acid; gradual, smooth boundary

B3—24 to 32 inches, weak-red (10R 4/4) clay; weak, fine, subangular blocky structure; firm, sticky and plastic; few roots; neutral, gradual, smooth boundary.

C—32 to 38 inches, dark reddish-brown (2 5YR 3/4) very shaly silty clay loam; massive; firm; 75 percent soft shale fragments; neutral; clear, smooth boundary

R—38 to 42 inches, soft red shale

Depth to bedrock ranges from 36 to 45 inches Thickness of the solum ranges from 26 to 42 inches. Unlimed soils are strongly acid or medium acid in the upper part of the B horizon and medium acid to neutral in the lower part The content of soft coarse fragments is as much as 25 percent in the lower part of the B horizon and ranges from 25 to 75 percent in the C horizon. Many of these fragments break down under mechanical analysis.

The Ap horizon is 5YR or 7.5YR hue, value of 3 or 4; and chroma of 2, 3, or 4 The B horizon is 5YR, 2 5YR, or 10R hue, value of 3 or 4, and chroma of 3 or 4 It is silty clay or clay The C horizon is silty clay loam, silty clay, or clay, or their shaly or very shaly analogs

The Upshur soils in this survey area are shallower over bedrock than is defined as the range for the series, but this difference does not alter their use or management.

Upshur soils are near the well drained Gilpin and Westmoreland soils, the moderately well drained Wharton soils, and the Vandalia soils, which are on foot slopes They are redder and finer textured than Gilpin and Westmoreland soils and are redder and better drained than Wharton soils They are generally less acid than Gilpin and Wharton soils They are generally less deep, have fewer coarse fragments in the A and B horizons, and are generally slightly finer textured than Vandalia soils

**Upshur silty clay, 8 to 15 percent slopes, severely eroded** (UhC3) —Except for a slightly thicker surface layer and subsoil, this soil has a profile similar to the one described as representative of the series. It is mainly on ridgetops and benches. Erosion has removed most of the original surface layer, and the subsoil is exposed in places. Gullies and slips are evident in some areas Included in mapping are a few small areas of Gilpin soils, a few small areas where the surface layer is silt loam, and a few where the soil is less sloping, less eroded, or shallower over bedrock than is typical.

This Upshur soil has limited suitability for cultivated crops and is better suited to hay and pasture. The erosion hazard is very severe in unprotected areas. Keeping tillage to a minimum, cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IVe-30, woodland subclass 3c.

**Upshur silty clay, 15 to 25 percent slopes, severely eroded** (UhD3) —This moderately steep soil has a profile similar to the one described as representative of the series. It is mostly on benches and narrow ridgetops Erosion has removed most of the original surface layer, and the subsoil is exposed in places Gullies and slips are common in some areas Included in mapping are small areas of Gilpin soils and a few small areas where the soil is less eroded, steeper, or shallower over bedrock than is typical

This Upshur soil is not suited to cultivated crops, but is suited to pasture and trees Bluegrass grows well The erosion hazard is very severe in unprotected areas. Rotational grazing, mowing, and proper stocking are needed in controlling erosion and runoff and in maintaining fertility. Capability unit VIe-1; woodland subclass north aspect 3c, south aspect 4c

## Urban Land

Urban land (UL), a mixture of a variety of material that varies in chemical and physical properties, is on flood plains, stream terraces, foot slopes, and uplands mainly in the cities and suburbs of Clarksburg, Bridgeport, and Grafton. This material is so altered or obscured by urban works, structures, and earth-moving equipment that identification of soils is not feasible. Slopes range from 0 to 35 percent. Onsite examination is needed to determine the suitability of any site for specific use No capability or woodland classification.

## Vandalia Series

The Vandalia series consists of deep, well-drained soils on foot slopes. These soils formed in colluvial material that moved downslope mainly from Upshur and Gilpin soils on uplands. They are mostly in the western part of Harrison County Slopes range from 3 to 25 percent.

In a representative profile, the surface layer is dark-brown silty clay loam about 9 inches thick. The reddish-brown subsoil extends to a depth of about 46 inches. The upper 13 inches is firm, slightly sticky and slightly plastic silty clay loam; the next 16 inches is firm, sticky and slightly plastic silty clay mottled with light gray and strong brown below a depth of 36 inches, the lower 8 inches is firm, sticky and slightly plastic channery silty clay. The underlying material is reddish-brown channery silty clay that extends to a depth of 55 inches or more

Vandalia soils have moderate to moderately high natural fertility The available moisture capacity is moderate to high Permeability is moderately slow to slow in the subsoil.

The less eroded Vandalia soils are suited to crops commonly grown in the survey area. They are mostly cleared and used mainly for hay or pasture

Because they are on foot slopes, these soils are commonly used for roads and homesites The slope, the moderately slow to slow permeability, the high shrink-swell potential, and the hazard of slippage are limitations to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Vandalia silty clay loam, 15 to

25 percent slopes, in a pasture along U. S. Route 19 about one-half mile south of its intersection with State Route 35, Harrison County:

Ap—0 to 9 inches, dark-brown (7.5YR 4/2) silty clay loam; moderate, medium, granular structure; friable; many roots; 5 percent coarse fragments; slightly acid; clear, smooth boundary.

B21t—9 to 22 inches, reddish-brown (5YR 4/4) silty clay loam; strong, medium, subangular blocky structure; firm, slightly sticky and slightly plastic; common roots; thin, continuous clay films; 10 percent coarse fragments; medium acid, gradual, smooth boundary.

B22t—22 to 38 inches, reddish-brown (5YR 4/4) silty clay; few, fine, distinct, light-gray (N 6/0) and strong-brown (7.5YR 5/8) mottles at a depth of about 36 inches, dark reddish-gray (5YR 4/2) ped faces, strong, medium and coarse, subangular blocky structure, firm, sticky and slightly plastic, few roots, thin, nearly continuous clay films; few manganese concretions, 15 percent coarse fragments, medium acid, gradual, wavy boundary.

B3t—38 to 46 inches, reddish-brown (5YR 4/4) channery silty clay; weak, fine, subangular blocky structure; firm, sticky and slightly plastic; few roots; thin, discontinuous clay films; many manganese coatings and concretions; 25 percent coarse fragments; medium acid; gradual, wavy boundary.

C—46 to 55 inches, reddish-brown (5YR 4/4) channery silty clay; massive, firm; common manganese coatings and concretions; 30 percent coarse fragments; medium acid.

Depth to bedrock is generally greater than 6 feet. Thickness of the solum ranges from 40 to 80 inches. Unlimed soils are strongly acid to medium acid throughout. The content of soft coarse fragments ranges from 10 to 35 percent in the B horizon and is as much as 50 percent in the C horizon. Many of these fragments break down under mechanical analysis.

The Ap horizon is 7.5YR hue, value of 4 or 5, and chroma of 2 or 4; or 10YR hue, value of 3 or 4, and chroma of 2, or value of 4 and chroma of 3. The B horizon is mainly 5YR hue, but the upper part is 7.5YR hue, value of 4 or 5, and chroma of 4 or 6. It is mainly silty clay loam, or silty clay, or their channery analogs. The C horizon is silty clay, or clay, or their channery analogs.

Vandalia soils are near the well-drained Gilpin and Upshur soils on uplands. They are deeper, finer textured, generally less acid, and redder than Gilpin soils. They are generally slightly coarser textured and deeper than Upshur soils.

**Vandalia silty clay loam, 3 to 8 percent slopes** (VaB).—Except for a thicker surface layer and subsoil, this soil has a profile similar to the one described as representative of the series. It is common on alluvial fans, along drainageways, and on lower foot slopes. Included in mapping are a few small areas of Nolin and Lindside soils, a few small areas where the soil is moderately well drained, a few where it has a silt loam surface layer, and a few where it is coarse textured.

This Vandalia soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is moderate in unprotected areas. Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IIe-15; woodland subclass 3c.

**Vandalia silty clay loam, 8 to 15 percent slopes** (VaC).—Except for thicker surface layer and subsoil, this soil has a profile similar to the one described as representative of the series. It is common on lower foot slopes and around streamheads. It is dissected by small drainageways in some areas. Seep spots and slips are common in places. Included in mapping are a few small areas where the soil is very stony; a few where it is severely eroded; and a few where it is less well drained, less red, or coarser textured than is typical.

This Vandalia soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is severe in unprotected areas. Cultivating and stripcropping on the contour, including hay in the cropping system, maintaining natural drainageways in sod, and returning crop residue to the soil help in controlling erosion and maintaining fertility and good tilth. Areas that are strongly dissected by drainageways and have slips are difficult to manage and are best maintained in permanent cover. Capability unit IIIe-15; woodland subclass 3c.

**Vandalia silty clay loam, 15 to 25 percent slopes** (VaD).—This moderately steep soil has the profile described as representative of the series. It is common on short foot slopes, on the upper part of long foot slopes, and around streamheads. It is dissected in places by drainageways, and slips are common in some areas. Included in mapping are a few areas where the soil has boulders on the surface; a few where the soil is moderately well drained; and a few where it is less red, coarser textured, or steeper than is typical.

This Vandalia soil has limited suitability for cultivated crops and is better suited to hay or pasture. The erosion hazard is severe in unprotected areas. Keeping tillage to a minimum, cultivating and stripcropping on the contour, including hay in the cropping system, maintaining natural drainageways in sod, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Areas that are strongly dissected by drainageways and have slips are difficult to manage and are best maintained in permanent cover. Capability unit IVe-15; woodland subclass 3c.

**Vandalia silty clay loam, 15 to 25 percent slopes, severely eroded** (VaD3).—This soil is more eroded and has a thinner surface layer and subsoil, but otherwise has a profile similar to the one described as representative of the series. It is common on short foot slopes, on the upper part of long foot slopes, and around streamheads. Erosion has removed most of the original surface layer, and the subsoil is exposed in some areas. The soil is dissected by drainageways, and slips are common in places. Included in mapping are small areas where the soil is stony, a few areas where the soil is steeper than is typical, and a few where the subsoil is exposed and the surface layer is silty clay.

This Vandalia soil is not suited to cultivated crops, but is suited to pasture and trees. Bluegrass grows well. The erosion hazard is very severe in unprotected areas. Rotational grazing, mowing, and proper stocking are needed in controlling erosion and runoff and in maintaining fertility. Capability unit VIe-3; woodland subclass 3c.

## Westmoreland Series

The Westmoreland series consists of deep, well-drained soils on uplands. These soils formed in lime-influenced material weathered from interbedded shale, siltstone, sandstone, and thin layers of limestone. They are mainly in the eastern two-thirds of Harrison County and the southwestern third of Taylor County. Slopes range from 8 to 60 percent.

In a representative profile, the surface layer is dark grayish-brown silt loam about 8 inches thick. The friable subsoil extends to a depth of about 33 inches. The upper 14 inches is yellowish-brown, channery silty clay loam, and the lower 11 inches is brown, very channery silty clay loam. The underlying material is a yellowish-brown, very channery silty clay loam that extends to shale and sandstone at a depth of 42 inches.

Westmoreland soils have moderate to moderately high natural fertility. The available moisture capacity is moderate to high. Permeability is moderate in the subsoil.

The less sloping Westmoreland soils are suited to crops commonly grown in the survey area. Most areas are cleared and are used mainly for hay or pasture. The steeper soils are mostly wooded or pastured.

The slope and the hazard of slippage are the main limitations to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Westmoreland silt loam, 25 to 35 percent slopes, in a pasture along State Route 13 at Saltwell, Harrison County

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, thin, platy structure; friable; few roots; 5 percent coarse fragments; medium acid; clear, smooth boundary

B2t—8 to 22 inches, yellowish-brown (10YR 5/4) channery silty clay loam; moderate, medium, subangular blocky structure; friable; common roots; thin, discontinuous clay films; 25 percent coarse fragments; medium acid, clear, gradual boundary.

B3—22 to 33 inches, brown (7 5YR 4/4) very channery silty clay loam; moderate, medium, subangular blocky structure; friable; 65 percent coarse fragments; medium acid; gradual, smooth boundary

C—33 to 42 inches, yellowish-brown (10YR 5/4) very channery silty clay loam; massive; firm; 85 percent coarse fragments; medium acid; gradual, smooth boundary.

R—42 inches, slightly weathered shale and sandstone

Depth to bedrock ranges from 40 to 50 inches. Thickness of the solum ranges from 20 to 40 inches Unlimed soils are medium acid to strongly acid throughout The content of soft coarse fragments ranges from 5 to 30 percent in the Ap and Bt horizons, from 5 to 70 percent in the B horizon, and from 50 to 90 percent in the C horizon. Many of these fragments break down under mechanical analysis

The Ap horizon is mainly 10YR hue, value of 4 or 5, and chroma of 2; or value of 3 or 4 and chroma of 3. The B horizon is 10YR or 7.5YR hue, value of 4 or 5, and chroma of 4 or 6 It is heavy loam, silt loam, or silty clay loam, or their shaly, channery, very shaly, or very channery analogs. The C horizon is silt loam, silty clay loam, or their very shaly or very channery analogs

Westmoreland soils are near the well drained Faywood, Gilpin, and Upshur soils; the moderately well drained Guernsey soils; and the moderately well drained Clarksburg soils, which are on foot slopes. They are deeper and coarser textured than Faywood soils, deeper and generally less acid than Gilpin soils, and less red and coarser textured than Upshur soils They are better drained and have a coarser textured lower B horizon than Guernsey soils They are better drained than Clarksburg soils; also, they differ from those soils in not having a fragipan

**Westmoreland silt loam, 8 to 15 percent slopes** (WmC).—Except for a thicker surface layer and subsoil, this soil has a profile similar to the one described as representative of the series. It is mainly on benches and ridgetops. Included in mapping are a few small areas of Guernsey, Upshur, Faywood, Gilpin, Clarksburg, and Culleoka soils and a few small areas where the soil is less sloping than is typical

This Westmoreland soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is severe in unprotected areas Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IIIe-11; woodland subclass 2o.

**Westmoreland silt loam, 8 to 15 percent slopes, severely eroded** (WmC3) —This soil is more eroded and generally contains more coarse fragments in the surface layer, but otherwise has a profile similar to the one described as representative of the series. It is mainly on benches and ridgetops Erosion has removed most of the original surface layer, and shallow gullies are evident in some areas Included in mapping are a few small areas of Upshur and Culleoka soils, a few small areas where the soil has a silty clay loam surface layer, and a few where it is less eroded than is typical.

This Westmoreland soil has limited suitability for cultivated crops and is better suited to hay and pasture. The erosion hazard is very severe in unprotected areas. Keeping tillage to a minimum, cultivating and stripcropping on the contour, including hay in the cropping system, maintaining natural drainageways in sod, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IVe-11, woodland subclass 2o.

**Westmoreland silt loam, 15 to 25 percent slopes** (WmD).—Except for a thicker surface layer and subsoil, this soil has a profile similar to the one described as representative of the series. It is on all parts of uplands, but is most common on benches and narrow ridgetops. Included in mapping are a few small areas of Guernsey, Faywood, Culleoka, and Gilpin soils and a few small areas where the soil has stones on the surface.

This Westmoreland soil has limited suitability for cultivated crops and is better suited to hay and pasture The erosion hazard is severe in unprotected areas. Keeping tillage to a minimum, cultivating and stripcropping on the contour, including hay in the cropping system, maintaining natural drainageways in sod, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IVe-11, woodland subclass north aspect 2r, south aspect 3r.

**Westmoreland silt loam, 15 to 25 percent slopes, severely eroded** (WmD3).—This soil is more eroded and generally contains more coarse fragments in the surface layer, but otherwise has a profile similar to the one described as representative of the series. It is on all parts of uplands, but is most common on benches and narrow ridgetops Erosion has removed most of the original surface layer, and shallow gullies have formed in some areas. Included in mapping are a few small areas of Upshur and Culleoka soils and a few small areas where the soil has a silty clay loam surface layer.

This Westmoreland soil is not suited to cultivated crops, but is suited to pasture and trees. Bluegrass grows well. The erosion hazard is very severe in unprotected areas. Rotational grazing, mowing, and proper stocking are needed in controlling erosion and runoff and in maintaining fertility. Capability unit VIe-1, woodland subclass north aspect 2r, south aspect 3r.

**Westmoreland silt loam, 25 to 35 percent slopes** (WmE) —This steep soil has the profile described as representative of the series It is common on hillsides Included in mapping are a few small areas of Culleoka and Upshur soils, a few small areas where the soil is severely eroded, and a few where it has stones on the surface.

This Westmoreland soil is not suited to cultivated crops, but is suited to pasture and trees Bluegrass grows well. The erosion hazard is severe in unprotected areas Rotational grazing, mowing, and proper stocking are needed in controlling erosion and runoff and in maintaining fertility. Capability unit VIe-1, woodland subclass north aspect 2r, south aspect 3r.

**Westmoreland silt loam, 25 to 35 percent slopes, severely eroded** (WmE3).—This soil is more eroded, slightly shallower over bedrock, and contains more coarse fragments in the surface layer, but otherwise has a profile similar to the one described as representative of the series. It is on hillsides. Erosion has removed most of the original surface layer, and shallow gullies and slips are common in some areas

Included in mapping are a few small areas of Upshur and Culleoka soils and a few small areas where the soil has a silty clay loam surface layer.

Because the slope is steep and the erosion hazard very severe in unprotected areas, this soil has limited suitability for pasture and is better suited to trees. Rotational grazing, mowing, and proper stocking are needed in controlling erosion and runoff and in maintaining fertility. The slope moderately limits the use of woodland equipment. Capability unit VIIe-1, woodland subclass north aspect 2r, south aspect 3r

**Westmoreland silt loam, 35 to 60 percent slopes** (WmF) —This soil is slightly shallower over bedrock, but otherwise has a profile similar to the one described as representative of the series It is mostly along breaks beneath ridgetops, between bench levels, and along valley walls. Slips are evident in places Included in mapping are a few small areas of Culleoka and Upshur soils and a few small areas where the soil is severely eroded.

Because the slope is very steep and the erosion hazard very severe in unprotected areas, this soil is best suited to trees. The slope severely limits the use of woodland equipment. Capability unit VIIe-1; woodland subclass north aspect 2r, south aspect 3r.

## Wharton Series

The Wharton series consists of deep, moderately well drained soils on uplands. These soils formed in acid material weathered mainly from clay shale. They are in a few small areas north of Shinnston and south of West Milford in Harrison County and in small areas in the eastern and northeastern two-thirds of Taylor County. Slopes range from 8 to 25 percent.

In a representative profile, the surface layer is dark grayish-brown silt loam 7 inches thick. The subsurface layer is yellowish-brown silt loam about 5 inches thick. The subsoil extends to a depth of 51 inches The upper 9 inches is strong-brown, firm silty clay loam, the next 9 inches is yellowish-brown, firm silty clay mottled with light gray; the lower 21 inches is mixed light-gray, very firm silty clay and brownish-yellow silty clay loam mottled with strong brown. The underlying material is strong-brown very shaly silt loam that has light-gray coatings. It extends to shale at a depth of 72 inches

Wharton soils have moderate to moderately low natural fertility. The available moisture capacity is moderate to high. Permeability is moderate in the upper part of the subsoil and slow to moderately slow in the middle and lower parts. A seasonal high water table is at a depth of 1½ to 2 feet.

Wharton soils are suited to crops commonly grown in the survey area Most of the acreage is cleared and used mainly for hay and pasture. The seasonal high water table limits the growth of a deep-rooted legume, such as alfalfa.

The seasonal high water table, the slow to moderately slow permeability, the moderate shrink-swell potential, and the hazard of slippage are limitations to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Wharton silt loam, 8 to 15 percent slopes, in a pasture along the west side of State Route 10/4, about one-half mile west of its intersection with State Route 10, Taylor County:

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

A2—7 to 12 inches, yellowish-brown (10YR 5/4) silt loam; weak, thin, platy structure; friable to firm; many roots; 5 percent coarse fragments; strongly acid; gradual, smooth boundary.

B21t—12 to 21 inches, strong-brown (7.5YR 5/8) silty clay loam; moderate, fine, subangular blocky structure; firm; common roots; thin, continuous clay films; very strongly acid; clear, smooth boundary

B22t—21 to 30 inches, yellowish-brown (10YR 5/6) silty clay; many, medium, faint, light-gray (10YR 6/1) mottles; moderate, medium, subangular blocky structure; firm; common roots; moderately thick, continuous clay films; very strongly acid; gradual, smooth boundary.

B3tg—30 to 51 inches, mixed light-gray (N 7/0) silty clay and brownish-yellow (10YR 6/6) silty clay loam with layers of thin shale fragments; many, medium, distinct, strong-brown (7.5YR 5/8) mottles; moderate, medium, prismatic structure parting to coarse subangular blocky, very firm; few roots; moderately thick, continuous clay films; 15 percent shale fragments; very strongly acid; gradual, smooth boundary

Cg—51 to 72 inches, strong-brown (7.5YR 5/8) very shaly silt loam; ped interiors with light-gray (N 7/0) silty clay surface coatings; weak, thin to medium, platy shale structure; firm; 85 percent soft coarse fragments; very strongly acid, wavy boundary

R—72 inches, brown soft silty shale.

Depth to bedrock ranges from 42 to 72 inches. Thickness of the solum ranges from 40 to 60 inches Depth to low chroma mottles ranges from 18 to 32 inches Unlimed soils are strongly acid to very strongly acid in the solum and very strongly acid to extremely acid in the C horizon. The content of soft coarse fragments ranges from 0 to 15 percent in the B2t horizon and from 5 to 50 percent in the B3 horizon and is as much as 90 percent in the C horizon Many of these fragments break down under mechanical analysis.

The Ap horizon is mainly 10YR hue, value of 4, and chroma of 2 or 3; or value of 5 and chroma of 3 The B2 horizon is 10YR hue, value of 5, and chroma of 3, 4, or 6, or value of 6 and chroma of 6; or 7 5YR hue, value of 5, and chroma of 4, 6, or 8 It is silty clay loam, silty clay, or clay. The C horizon is silt loam, silty clay loam, silty clay, or clay, or their shaly or very shaly analogs.

Wharton soils are near the well-drained Culleoka, Gilpin, and Upshur soils. They are less well drained and deeper than those soils. They are finer textured in the lower part of the B horizon than Culleoka and Gilpin soils and are generally more acid than Culleoka and Upshur soils.

**Wharton silt loam, 8 to 15 percent slopes** (WrC).—This strongly sloping soil has the profile described as representative of the series. It is mostly on ridgetops and benches. Seep spots are evident in some areas. Included in mapping are a few small areas of Gilpin, Upshur, and Culleoka soils; a few small areas where the soil is somewhat poorly and poorly drained; and a few where it is less sloping than is typical.

This Wharton soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is severe in unprotected areas. Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IIIe-13; woodland subclass 2w.

**Wharton silt loam, 15 to 25 percent slopes** (WrD).—Except for a thinner surface layer and subsoil, this soil has a profile similar to the one described as representative of the series. It is mostly on ridgetops and benches. Included in mapping are a few small areas of Gilpin, Upshur, and Culleoka soils and a few small areas where the soil is less sloping than is typical.

This Wharton soil has limited suitability for cultivated crops and is better suited to hay and pasture. The erosion hazard is severe in unprotected areas. Keeping tillage to a minimum, cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop

residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IVe-9, woodland subclass 2w.

## Zoar Series

The Zoar series consists of deep, moderately well drained soils on terraces. These soils formed in old acid alluvial material washed from soils underlain by shale, siltstone, and sandstone. They are mostly in the eastern and central part of Harrison County and in one small areas in the western part of Taylor County, just north of U. S. Route 50 along Husted Creek. Slopes range from 3 to 15 percent

In a representative profile, the surface layer is 2 inches of black silt loam over 5 inches of dark-brown silt loam. The subsoil extends to a depth of about 47 inches The upper 17 inches is strong-brown, friable to firm silty clay loam; the next 8 inches is yellowish-brown, firm light silty clay loam mottled with strong brown and gray, the lower 15 inches is gray, very firm silty clay mottled with strong brown. The underlying material is reddish-brown clay mottled with strong brown and light gray. It extends to a depth of 62 inches or more

Zoar soils have moderate to moderately low natural fertility. The available moisture capacity is moderate to high. Permeability is moderately slow in the upper part of the subsoil and slow in the middle and lower parts. A seasonal high water table is at a depth of 1½ to 2½ feet.

Zoar soils are suited to crops commonly grown in the survey area. Most of the acreage is cleared and used mainly for hay and pasture The seasonal high water table limits the growth of a deep-rooted legume, such as alfalfa

The seasonal high water table, the slope, the slow permeability, and the moderate to high shrink-swell potential are limitations to be considered in planning homesites and in locating roads or septic tank absorption fields.

Representative profile of Zoar silt loam, 3 to 8 percent slopes, in an idle field, 400 feet west of U. S. Highway 19 and one-fourth mile south of Gypsy, Harrison County:

Ap—0 to 2 inches, black (10YR 2/1) silt loam; moderate, fine, granular structure; friable; many roots; strongly acid; clear, smooth boundary.

Ap2—2 to 7 inches, dark-brown (10YR 4/3) silt loam; weak, thin, platy structure; friable; many roots; strongly acid; abrupt, smooth boundary.

B21t—7 to 16 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; friable to firm; many roots; moderately thick, continuous clay films; strongly acid; gradual, smooth boundary.

B22t—16 to 24 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm; common roots; moderately thick, continuous clay films; strongly acid; clear, smooth boundary

B23t—24 to 32 inches, yellowish-brown (10YR 5/6) light silty clay; common, medium, distinct, strong-brown (7.5YR 5/6) and gray (10YR 6/1) mottles; moderate, medium, angular blocky structure, firm, nonsticky and slightly plastic; few roots; thin, discontinuous clay films; strongly acid; clear, smooth boundary

B31g—32 to 37 inches, gray (10YR 6/1) silty clay; common, medium, distinct, strong-brown (7 5YR 5/6) mottles; moderate, medium, prismatic structure; very firm, nonsticky and slightly plastic; few roots along faces of prisms; moderately thick, continuous clay films on prism faces; strongly acid; gradual, smooth boundary

B32g—37 to 47 inches, gray (10YR 6/1) silty clay; common, medium, distinct, strong-brown (7.5YR 5/8) mottles; moderate, coarse, prismatic structure; very firm, nonsticky and slightly plastic; strongly acid; clear, smooth boundary.

IIC1—47 to 52 inches, reddish-brown (5YR 5/3) clay; common, medium, distinct, strong-brown (7.5YR 5/8) and light-gray (N 7/0) mottles; weak, coarse, angular blocky structure; firm, slightly sticky and plastic; prominent manganese coatings on ped faces; very strongly acid; clear, smooth boundary

IIC2—52 to 62 inches, reddish-brown (5YR 5/3) clay; common, medium, distinct, strong-brown (7.5YR 5/8) and light-gray (N 7/0) mottles; massive, firm, slightly sticky and plastic; few manganese coatings; very strongly acid.

Depth to bedrock is generally greater than 4 feet. Thickness of the solum ranges from 30 to 48 inches Depth to low chroma mottles ranges from 16 to 28 inches. Unlimed soils are strongly acid to very strongly acid throughout.

The Ap horizon is mainly 10YR hue, value of 3 or 4, and chroma of 3 The B2t horizon is 10YR hue, value of 5 or 6, and chroma of 6 or 8; 7.5YR hue, value of 5 or 6, and chroma of 6, or value of 5 and chroma of 8; or 5YR hue, value of 5 or 6, and chroma of 6 or 8 The B3g horizon is mainly 10YR hue, value of 5 or 6, and chroma of 1 or 2. The B horizon is mainly silty clay loam or silty clay. The C horizon is mainly silty clay or clay.

Zoar soils are near the well drained Allegheny soils, the moderately well drained Monongahela soils, and the somewhat poorly drained Tygart soils They are less well drained and have a finer textured B horizon than Allegheny soils They have a finer textured B horizon than Monongahela soils; also, they differ from those soils in not having a fragipan They are better drained than Tygart soils

**Zoar silt loam, 3 to 8 percent slopes** (ZoB).—This gently sloping soil has the profile described as representative of the series. It is on broad terraces and benches. Included in mapping are small areas of Monongahela and Tygart soils and a few small areas where the upper part of the soil is redder than is typical.

This Zoar soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is moderate in unprotected areas. Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth Capability unit IIe-13; woodland subclass 3w.

**Zoar silt loam, 8 to 15 percent slopes** (ZoC).—Except for a slightly thinner surface layer and subsoil, this soil has a profile similar to the one described as representative of the series It is mostly along the outer edges of terraces, along slopes above drainageways, and in areas dissected by drainageways. Included in mapping are a few small areas of Monongahela and Allegheny soils and a few small areas where the upper part of the soil is redder than is typical

This Zoar soil is suited to commonly grown cultivated crops and to hay and pasture. The erosion hazard is severe in unprotected areas Cultivating and stripcropping on the contour, including hay in the cropping system, and returning crop residue to the soil help in controlling erosion and in maintaining fertility and good tilth. Capability unit IIIe-13; woodland subclass 3w.

# *Use and Management of Soils*

This section suggests guidelines in managing soils for crops and pasture; explains the system of capability classification used by the Soil Conservation Service; lists the estimated yields of principal crops and pasture grasses, and describes the use and management of the soils for woodland, wildlife, engineering, and town and country planning

See the "Guide to Mapping Units" at the back of this survey to find the capability classification of a given soil. The use and management of individual soils for crops and pasture is suggested under the heading "Descriptions of the Soils."

## Crops and Pasture

The major crops in Harrison and Taylor Counties are corn, small grain, grasses, and legumes.

Most of the soils are strongly sloping to very steep, are moderately eroded or severely eroded, and require lime and fertilizer. Thus, controlling erosion and improving or maintaining fertility are the main management needs Contour stripcropping and a crop sequence that includes hay help in controlling erosion and runoff. Artificial drainage is needed on Atkins, Melvin, and other wet soils. Many very stony soils are used for woodland.

Soils on the uplands make up most of the acreage in the survey area. Most are too steep for cultivated crops, but the less sloping ones are well suited to grasses and legumes Gilpin and other soils that are low to moderate in natural fertility generally require more lime and fertilizer than the more fertile Westmoreland soils.

Clarksburg, Ernest, and Vandalia soils, which are on foot slopes, have limited suitability for cultivated crops, but are well suited to grasses and legumes. Ernest soils are moderate in natural fertility and generally require more lime and fertilizer than Clarksburg or Vandalia soils.

Monongahela and Tygart soils, which are on stream terraces, are well suited to crops if adequate amounts of lime and fertilizer are added They are not suited to alfalfa and other legumes that cannot tolerate wetness.

Hackers, Lindside, and Nolin soils, which are on flood plains, are well suited to corn and other cultivated crops. Chavies, Pope, and Philo soils are also well suited, but ordinarily require additional lime and fertilizer. Crops are damaged occasionally by floodwater.

## Capability Grouping

Some readers, particularly those who farm on a large scale, may find it practical to use and manage alike some of the different kinds of soil. These readers can make good use of the capability classification system, a grouping that shows, in a general way, the suitability of soils for most kinds of farming.

The grouping is based on limitations of soils when used for field crops, the risk of damage when they are farmed, and the way the soils respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management.

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

In the capability system, all kinds of soil are grouped at three levels: the class, the subclass, and the unit. These levels are described in the paragraphs that follow. The unit designation for each soil is listed in the Guide to Mapping Units.

Capability Classes are the broadest groups and are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, so shallow, or otherwise so limited that they do not produce worthwhile yields of crops, forage, or wood products.

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

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

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

Following is a descriptive outline of the system as it applies in Harrison and Taylor Counties.

Class I soils have few limitations that restrict their use.
(No subclasses).
Unit I-6. Deep, well-drained, nearly level, medium-textured and moderately coarse textured, acid and lime-influenced soils on high bottom land.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
Subclass IIe: Soils subject to moderate erosion unless protected.
Unit IIe-4. Deep, well-drained, gently sloping, medium-textured, acid soils on uplands.
Unit IIe-10. Moderately deep, well-drained, gently sloping, medium-textured, acid soils on uplands.
Unit IIe-13. Deep, moderately well drained, gently sloping, medium-textured, acid soils that have a fragipan or a clayey layer in the subsoil.
Unit IIe-14. Deep, moderately well drained, gently sloping, medium-textured, lime-influenced soils that have a fragipan or a clayey layer in the subsoil.
Unit IIe-15. Deep, well-drained, gently sloping, moderately fine-textured, lime-influenced soils on foot slopes.
Subclass IIw: Soils moderately limited by excess water.
Unit IIw-6. Deep, well-drained, nearly level, medium-textured, acid and lime-influenced soils on flood plains.

Unit IIw-7 Deep, moderately well drained, nearly level, medium-textured, acid and lime-influenced soils on flood plains.

Class III soils have severe limitations that reduce the choice of plants, or require special conservation practices, or both
- Subclass IIIe Soils subject to severe erosion if they are cultivated and not protected.
  - Unit IIIe-4 Deep, well-drained, strongly sloping, medium-textured, acid soils on stream terraces and uplands
  - Unit IIIe-10 Moderately deep, well-drained, strongly sloping, medium-textured, acid soils on uplands.
  - Unit IIIe-11 Moderately deep and deep, well-drained, strongly sloping, medium-textured, lime-influenced soils on uplands
  - Unit IIIe-12. Moderately deep, well-drained, strongly sloping, moderately coarse textured, acid soils on uplands
  - Unit IIIe-13. Deep, moderately well drained, strongly sloping, medium-textured, acid soils that have a fragipan or a clayey layer in the subsoil
  - Unit IIIe-14. Deep, moderately well drained, strongly sloping, medium-textured, lime-influenced soils that have a fragipan or a clayey layer in the subsoil.
  - Unit IIIe-15. Deep and moderately deep, well-drained, strongly sloping, medium-textured and moderately fine textured, lime-influenced soils on uplands and foot slopes.
- Subclass IIIw: Soils severely limited for cultivation by excess water.
  - Unit IIIw-1. Deep, poorly drained, nearly level, medium-textured, acid and lime-influenced soils on flood plains.
  - Unit IIIw-5 Deep, somewhat poorly drained, nearly level, medium-textured, acid soils on terraces

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.
- Subclass IVe: Soils subject to very severe erosion if they are cultivated and not protected.
  - Unit IVe-3. Deep and moderately deep, well-drained, moderately steep, medium-textured, acid soils on stream terraces and uplands.
  - Unit IVe-9. Deep, moderately well drained, moderately steep, medium-textured, acid and lime-influenced soils that have a fragipan or a clayey layer in the subsoil.
  - Unit IVe-11. Moderately deep and deep, well-drained, moderately steep and strongly sloping, medium-textured, lime-influenced soils on uplands.
  - Unit IVe-15. Deep and moderately deep, well-drained, moderately steep and strongly sloping, medium-textured and moderately fine-textured, lime-influenced soils on uplands and foot slopes.
  - Unit IVe-30. Moderately deep and deep, well-drained, strongly sloping, fine-textured, lime-influenced soils on uplands.

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.
- Subclass Vw: Soils too wet for cultivation; drainage generally not feasible.
  - Unit Vw-1 Deep, nearly level soils, on flood plains, that vary in drainage and texture.

Class VI soils have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture, woodland, or wildlife
- Subclass VIe: Soils severely limited, chiefly by risk of erosion, unless protective cover is maintained.
  - Unit VIe-1. Deep and moderately deep, well drained and moderately well drained, moderately steep and steep, medium-textured to fine-textured, lime-influenced soils on uplands and foot slopes.
  - Unit VIe-2 Moderately deep, well-drained, steep, medium-textured, acid soils on uplands.
  - Unit VIe-3 Deep and moderately deep, well-drained, moderately steep and steep, medium-textured to fine-textured, acid and lime-influenced soils on uplands and foot slopes
- Subclass VIs. Soils generally unsuitable for cultivation and limited for other uses by low available moisture capacity, stones, or other features.
  - Unit VIs-2. Deep, moderately well drained, gently sloping to steep, medium-textured, very stony, acid soils that have a fragipan in the subsoil.

Class VII soils have very severe limitations that make them unsuitable for cultivation and restrict their use largely to pasture, woodland, or wildlife.
- Subclass VIIe· Soils very severely limited, chiefly by risk of erosion unless protective cover is maintained.
  - Unit VIIe-1 Moderately deep and deep, well-drained, steep and very steep, medium-textured to fine-textured, lime-influenced soils on uplands.
  - Unit VIIe-2. Moderately deep, well-drained, very steep, medium-textured, acid soils on uplands
- Subclass VIIs: Soils very severely limited by low available moisture capacity, stones, or other soil features.
  - Unit VIIs-2 Moderately deep, well-drained, gently sloping to very steep, very stony, acid soils on uplands.
  - Unit VIIs-4. Moderately deep, well-drained, very steep, extremely stony, acid soils on uplands.

Class VIII soils and landforms have limitations that preclude their use for commercial crop production and restrict their use to recreation, wildlife, or water supply, or to aesthetic purposes.
- Subclass VIIIw. Extremely wet, marshy land.
  - Unit VIIIw-1. Wet soils on flood plains overwashed by material from strip mines.

## Estimated Yields

Table 2 shows the estimated yields of the principal crops commonly grown in Harrison and Taylor Counties These yields are estimated for two levels of management and are listed under columns A and B. They are based on records kept by farmers in the counties, on recent reports of the U.S. Census of Agriculture, on data from the West Virginia University Agricultural Experiment Station, and on the observations and experiences of representatives of the Soil Conservation Service and others who have a knowledge of the soils and crops in the survey area The yields shown are averages that can be expected over a period of 10 years In any one year, yields can be affected by several factors, such as weather, plant diseases, or insects.

TABLE 2.—*Estimated average yields per acre of principal crops under two levels of management*

[Figures in columns A are yields to be expected under ordinary management; those in columns B are yields to be expected under improved management. Dashes indicate that the soil is not suited to the crop specified. Only arable soils are listed]

| Soil | Corn | | Wheat | | Clover grass (hay) | | Alfalfa grass (hay) | | 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] |
| Allegheny silt loam, 8 to 15 percent slopes | 50 | 105 | 20 | 40 | 1.5 | 3.0 | 2.0 | 4.0 | 60 | 140 |
| Allegheny silt loam, 15 to 25 percent slopes | 45 | 90 | 15 | 35 | 1.5 | 3.0 | 2.0 | 3.5 | 60 | 135 |
| Atkins silt loam | | 90 | | | | 3.0 | | | 60 | 130 |
| Chavies fine sandy loam | 70 | 120 | 25 | 45 | 2.0 | 3.5 | 2.5 | 4.5 | 100 | 150 |
| Clarksburg silt loam, 3 to 8 percent slopes | 55 | 95 | 20 | 40 | 2.0 | 3.0 | 2.0 | 3.5 | 75 | 140 |
| Clarksburg silt loam, 8 to 15 percent slopes | 50 | 90 | 20 | 40 | 2.0 | 3.0 | 2.0 | 3.5 | 75 | 140 |
| Clarksburg silt loam, 15 to 25 percent slopes | 45 | 80 | 15 | 35 | 1.5 | 3.0 | 1.5 | 3.0 | 70 | 135 |
| Clarksburg silt loam, 15 to 25 percent slopes, severely eroded | | | | | | | | | 60 | 125 |
| Cookport silt loam, 3 to 8 percent slopes | 40 | 90 | 20 | 35 | 2.0 | 3.0 | 1.5 | 3.0 | 50 | 135 |
| Cookport silt loam, 8 to 15 percent slopes | 40 | 85 | 15 | 35 | 2.0 | 3.0 | 1.5 | 3.0 | 50 | 130 |
| Culleoka silt loam, 8 to 15 percent slopes | 45 | 80 | 15 | 30 | 1.5 | 3.0 | 2.0 | 3.5 | 60 | 130 |
| Culleoka silt loam, 15 to 25 percent slopes | 40 | 75 | 15 | 30 | 1.5 | 2.5 | 1.5 | 3.0 | 60 | 115 |
| Culleoka silt loam, 25 to 35 percent slopes | | | | | | | | | 55 | 100 |
| Dekalb sandy loam, 8 to 15 percent slopes | 40 | 75 | 15 | 35 | 1.5 | 2.5 | 1.5 | 3.0 | 45 | 115 |
| Ernest silt loam, 3 to 8 percent slopes | 50 | 95 | 20 | 40 | 2.0 | 3.0 | 2.0 | 3.5 | 75 | 135 |
| Ernest silt loam, 8 to 15 percent slopes | 45 | 85 | 20 | 35 | 2.0 | 3.0 | 2.0 | 3.5 | 75 | 135 |
| Ernest silt loam, 15 to 25 percent slopes | 40 | 80 | 15 | 30 | 1.5 | 2.5 | 1.5 | 3.0 | 70 | 120 |
| Ernest very stony silt loam, 3 to 15 percent slopes | | | | | | | | | 60 | 110 |
| Ernest very stony silt loam, 15 to 35 percent slopes | | | | | | | | | 50 | 90 |
| Faywood silty clay loam, 8 to 15 percent slopes | 50 | 90 | 15 | 35 | 2.0 | 3.0 | 2.0 | 4.0 | 75 | 135 |
| Faywood silty clay loam, 15 to 25 percent slopes | | | | | | | | | 75 | 125 |
| Gilpin silt loam, 3 to 8 percent slopes | 45 | 85 | 20 | 35 | 1.5 | 3.0 | 2.0 | 3.5 | 60 | 130 |
| Gilpin silt loam, 8 to 15 percent slopes | 45 | 85 | 15 | 30 | 1.5 | 3.0 | 2.0 | 3.5 | 60 | 125 |
| Gilpin silt loam, 15 to 25 percent slopes | 40 | 75 | 15 | 30 | 1.5 | 2.5 | 1.5 | 3.0 | 50 | 115 |
| Gilpin silt loam, 25 to 35 percent slopes | | | | | | | | | 45 | 100 |
| Gilpin-Upshur complex, 8 to 15 percent slopes | 50 | 80 | 15 | 30 | 1.5 | 3.0 | 2.0 | 3.5 | 75 | 130 |
| Gilpin-Upshur complex, 8 to 15 percent slopes, severely eroded | 45 | 75 | 15 | 25 | 1.0 | 2.5 | 1.5 | 3.0 | 70 | 125 |
| Gilpin-Upshur complex, 15 to 25 percent slopes | 45 | 70 | 15 | 25 | 1.0 | 2.5 | 1.5 | 3.0 | 70 | 120 |
| Gilpin-Upshur complex, 15 to 25 percent slopes, severely eroded | | | | | | | | | 50 | 110 |
| Gilpin-Upshur complex, 25 to 35 percent slopes | | | | | | | | | 60 | 110 |
| Guernsey silt loam, 3 to 8 percent slopes | 45 | 90 | 20 | 35 | 2.0 | 3.0 | 2.0 | 3.5 | 75 | 135 |
| Guernsey silt loam, 8 to 15 percent slopes | 40 | 85 | 20 | 35 | 2.0 | 3.0 | 2.0 | 3.5 | 75 | 130 |
| Guernsey silt loam, 15 to 25 percent slopes | 40 | 80 | 20 | 30 | 1.5 | 2.5 | 2.0 | 3.0 | 75 | 125 |
| Guernsey silt loam, 15 to 25 percent slopes, severely eroded | | | | | | | | | 60 | 120 |
| Hackers silt loam | 70 | 125 | 25 | 45 | 2.0 | 3.5 | 2.5 | 4.5 | 110 | 150 |
| Lindside silt loam | 70 | 120 | 20 | 40 | 2.0 | 3.5 | 2.0 | 4.0 | 100 | 150 |
| Melvin silt loam | | 105 | | | | 3.0 | | | 60 | 130 |
| Monongahela silt loam, 3 to 8 percent slopes | 40 | 90 | 20 | 40 | 2.0 | 3.0 | 1.5 | 3.5 | 70 | 135 |
| Monongahela silt loam, 8 to 15 percent slopes | 40 | 85 | 20 | 35 | 2.0 | 3.0 | 1.5 | 3.0 | 65 | 135 |
| Nolin silt loam | 70 | 125 | 25 | 45 | 2.0 | 3.5 | 2.5 | 4.5 | 110 | 150 |
| Philo silt loam | 70 | 120 | 20 | 40 | 2.0 | 3.5 | 2.0 | 4.0 | 90 | 145 |
| Pope silt loam | 70 | 125 | 25 | 45 | 2.0 | 3.5 | 2.5 | 4.5 | 100 | 140 |
| Rayne silt loam, 3 to 8 percent slopes | 55 | 110 | 20 | 40 | 1.5 | 3.0 | 2.0 | 4.0 | 60 | 140 |
| Rayne silt loam, 8 to 15 percent slopes | 50 | 95 | 15 | 40 | 1.5 | 3.0 | 2.0 | 4.0 | 60 | 140 |
| Tygart silt loam | 35 | 85 | | | 2.0 | 3.0 | | | 70 | 130 |
| Udifluvents and Fluvaquents | | | | | | | | | 50 | 100 |
| Upshur silty clay, 8 to 15 percent slopes, severely eroded | 30 | 70 | 15 | 25 | 2.0 | 3.0 | 2.0 | 3.5 | 75 | 130 |
| Upshur silty clay, 15 to 25 percent slopes, severely eroded | | | | | | | | | 60 | 115 |
| Vandalia silty clay loam, 3 to 8 percent slopes | 50 | 100 | 20 | 35 | 2.0 | 3.0 | 2.0 | 4.0 | 75 | 135 |
| Vandalia silty clay loam, 8 to 15 percent slopes | 45 | 95 | 20 | 35 | 2.0 | 3.0 | 2.0 | 4.0 | 75 | 135 |
| Vandalia silty clay loam, 15 to 25 percent slopes | 40 | 85 | 20 | 30 | 1.5 | 2.5 | 1.5 | 3.5 | 70 | 115 |
| Vandalia silty clay loam, 15 to 25 percent slopes, severely eroded | | | | | | | | | 60 | 115 |
| Westmoreland silt loam, 8 to 15 percent slopes | 50 | 90 | 20 | 35 | 1.5 | 3.0 | 2.0 | 3.5 | 70 | 135 |
| Westmoreland silt loam, 8 to 15 percent slopes, severely eroded | 45 | 80 | 15 | 30 | 1.5 | 2.5 | 1.5 | 3.0 | 65 | 120 |
| Westmoreland silt loam, 15 to 25 slopes | 45 | 80 | 15 | 30 | 1.5 | 2.5 | 1.5 | 3.0 | 65 | 120 |
| Westmoreland silt loam, 15 to 25 percent slopes, severely eroded | | | | | | | | | 60 | 105 |
| Westmoreland silt loam, 25 to 35 percent slopes | | | | | | | | | 55 | 105 |
| Wharton silt loam, 8 to 15 percent slopes | 40 | 75 | 20 | 30 | 2.0 | 3.0 | 1.5 | 3.5 | 70 | 135 |
| Wharton silt loam, 15 to 25 percent slopes | 40 | 70 | 20 | 30 | 2.0 | 2.5 | 1.5 | 3.0 | 65 | 125 |
| Zoar silt loam, 3 to 8 percent slopes | 40 | 85 | 20 | 35 | 2.0 | 3.0 | 1.5 | 3.0 | 65 | 135 |
| Zoar silt loam, 8 to 15 percent slopes | 40 | 80 | 20 | 30 | 2.0 | 3.0 | 1.5 | 3.0 | 60 | 135 |

[1] The number of days a year one cow, horse, or steer can graze an acre without injury to pasture

Yields in columns A are estimated for the management now used by farmers. Those in columns B are estimated for the best management practical on the soils, including proper kinds and amounts of fertilizer

The management needed to obtain the yields in columns B consists of liming to the pH required for the crop, applying fertilizer according to needs determined by soil tests, choosing a suitable cropping system, and draining and otherwise conserving soil and water. Animal residue generally is not used extensively, except on dairy farms.

The management needed to obtain the estimated yields in columns B for pasture consists of applying enough fertilizer to provide phosphate and potash as needed and enough lime to maintain a pH of 6.0 to 6 5 Irrigation is not considered.

Nolin soils, which are deep and have favorable texture and high available moisture capacity, respond better to improved management than Faywood soils, which are high in natural fertility but have poor physical properties

## Woodland [2]

Nearly 45 percent, or 171,000 acres, of the survey area, is wooded (*12*). Only 1,600 acres is in noncommercial forest. Of the commercial forest, all but 300 acres is privately owned (*5*). Wooded tracts are mostly small, scattered farm woodlots and individual holdings Larger tracts and more continuous woodland areas are more common in the southwestern and eastern parts of the survey area

The most common forest types, or natural associations of tree species, are the oak-hickory type, about 71 percent of the wooded area; the maple-beech-birch type, about 19 percent; other hardwood types, about 5 percent; and pine types, about 5 percent (*5*)

The oak-hickory type is common on most upland slopes; the pine types are most common as natural regeneration in abandoned fields; the maple-beech-birch type occurs mainly at higher elevations; and other hardwoods, such as yellow-poplar, occur in small, scattered sites along small streams and in sheltered coves (fig. 7).

Because the acreage of soil having moderate available moisture capacity and ample rainfall is extensive, the potential for tree crops is favorable About 55 percent of the total land area is in woodland class 2, which indicates *very good* production potential; about 40 percent is in woodland class 3, *good* production potential, about 4 percent is in woodland class 1, *excellent* production potential; and only 1 percent is in woodland class 4, *fair* production potential.

Soil properties have a strong influence on tree species, tree growth, and woodland management. Soil depth and texture, for example, can determine the available water capacity and thereby influence the occurrence of species and the growth rate. Other features, such as slope, stoniness, rockiness, or a clayey subsoil, affect management Aspect, or the direction in which a sloping soil faces, can also affect the species, growth, and management. On some sloping soils, generally those steeper than 20 percent, aspect affects site index

The soils of the survey area are rated according to their suitability for woodland in table 3 Aspect, site index, woodland subclass, hazards and limitations that affect woodland management, and species preference and suitability are shown in the table and explained in the following paragraphs.

[2] JOHN L. GORMAN, woodland conservationist, helped prepare this section.

*Figure 7.*—**Stand of yellow-poplar and other hardwoods on Ernest silt loam, 3 to 8 percent slopes.**

The productivity of soils for trees is measured by site index, or the average height, in feet, of the dominant and codominant trees of a species or group of species in a well-stocked stand at 50 years of age. For example, if the site index for upland oaks is 70 on a given soil, the dominant and codominant trees in a stand of oaks on that soil have an average height of 70 feet when the trees are 50 years old. Table 4 shows the site index for upland oaks, yellow-poplar, and Virginia pine. A site index rating in table 4 can be translated into potential yields for each soil. It is shown as a range for the common species typically found on a given soil.

The soils of the area have been evaluated according to a nationwide system established by woodland conservationists and soil scientists of the Soil Conservation Service In this system, mapping units are assigned to woodland *classes* according to their potential productivity for a tree species or group of tree species. They are assigned to *subclasses* according to selected soil properties or characteristics that can restrict woodland management.

The woodland classes, which define a range of site index, indicate potential soil productivity. Within the Northeast Region, which includes the State of West Virginia, six woodland classes are established.

Classes are designated by Arabic numerals 1 through 6. Class 1 is potentially the highest in productivity, followed

TABLE 3.—*Wood crops*

[Preferred species are not listed in order of preference. Red pine is best suited at elevations of more than 2,000 feet. Dashes in the Aspect column. Christmas tree

| Soil series and map symbols | Woodland subclass | Aspect | Potential soil productivity | | Factors in management | | |
|---|---|---|---|---|---|---|---|
| | | | Species | Site index | Erosion hazard | Equipment restrictions | Seedling mortality |
| Allegheny: | | | | | | | |
| AgC | 2o | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Slight | Slight | Slight |
| AgD | 2r | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Moderate | Moderate | Slight |
| Atkins: At | 1w | | Pin oak | 85+ | Slight | Severe | Severe |
| Chavies: Ch | 2o | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Slight | Slight | Slight |
| Clarksburg: | | | | | | | |
| ClB | 2w | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Slight | Moderate | Slight |
| ClC | 2w | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Moderate | Moderate | Slight |
| ClD, ClD3 | 2w | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Severe | Moderate | Slight |
| Cookport: | | | | | | | |
| CoB | 2w | | Upland oaks<br>Black cherry | 75–85<br>75–85 | Slight | Moderate | Slight |
| CoC | 2w | | Upland oaks<br>Black cherry | 75–85<br>85–95 | Slight | Moderate | Slight |
| Culleoka: | | | | | | | |
| CuC | 2o | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Slight | Slight | Slight |
| CuD, CuE, CuE3 | 2r | North | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Moderate | Moderate | Slight |
| | 3r | South | Upland oaks<br>Yellow-poplar | 65–75<br>75–85 | Moderate | Moderate | Slight |
| CuF3 | 2r | North | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Severe | Severe | Slight |
| | 3r | South | Upland oaks<br>Yellow-poplar | 65–75<br>75–85 | Severe | Severe | Slight |

*and management*

indicate aspect is not a significant factor in determining woodland subclass; those in the last column indicate soils are not suitable for managed plantations]

| Factors in management—Continued | | | Preferred species— | | Suitable species— |
|---|---|---|---|---|---|
| Plant competition | | Windthrow hazard | Existing stands | For planting | For Christmas trees |
| Conifers | Hardwoods | | | | |
| Severe | Moderate | Slight | Red oak, white oak, black oak, white ash, black walnut, yellow-poplar. | White pine, yellow-poplar, black walnut, Norway spruce. | Scotch pine, white pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, white oak, black oak, white ash, black walnut, yellow-poplar. | White pine, yellow-poplar, Norway spruce, black walnut. | Scotch pine, white pine, Norway spruce. |
| Severe | Moderate | Moderate | Pin oak, red maple, sycamore | White pine. | ---------- |
| Slight | Severe | Slight | Red oak, white oak, yellow-poplar, white ash, black walnut. | White pine, Virginia pine, Norway spruce, yellow-poplar, black walnut | Scotch pine, white pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, white oak, black oak, yellow-poplar, black walnut, white ash, black locust | White pine, yellow-poplar, Norway spruce, black locust, Japanese larch | Scotch pine, white pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, white oak, black oak, yellow-poplar, black walnut, white ash, black locust. | White pine, yellow-poplar, Norway spruce, black locust, Japanese larch | Scotch pine, white pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, white oak, black oak, yellow-poplar, black walnut, black locust, white ash. | White pine, yellow-poplar, Norway spruce, black locust, Japanese larch | Scotch pine, white pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, black cherry, white ash, sugar maple. | White pine, black cherry, Norway spruce. | Scotch pine, white pine, Norway spruce |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, black cherry, white ash, sugar maple. | White pine, black cherry, Norway spruce. | Scotch pine, white pine, Norway spruce |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, black cherry, sugar maple, black walnut. | White pine, yellow-poplar, black walnut, Virginia pine, Norway spruce | White pine, Scotch pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, black cherry, sugar maple, black walnut. | White pine, yellow-poplar, black walnut, Virginia pine, Norway spruce. | White pine, Scotch pine, Norway spruce |
| Moderate | Moderate | Slight | Red oak, white oak, yellow-poplar, black cherry, sugar maple, black walnut | White pine, Virginia pine, Norway spruce, Japanese larch. | White pine, Scotch pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, black cherry, sugar maple, black walnut. | White pine, yellow-poplar, black walnut, Virginia pine, Norway spruce. | ---------- |
| Moderate | Moderate | Slight | Red oak, white oak, yellow-poplar, black cherry, sugar maple, black walnut. | White pine, Virginia pine, Norway spruce, Japanese larch. | ---------- |

TABLE 3.—*Wood crops and*

| Soil series and map symbols | Woodland subclass | Aspect | Potential soil productivity | | Factors in management | | |
|---|---|---|---|---|---|---|---|
| | | | Species | Site index | Erosion hazard | Equipment restrictions | Seedling mortality |
| Dekalb: | | | | | | | |
| DeC | 4f | | Upland oaks<br>White pine | 55–65<br>65–75 | Slight | Slight | Moderate |
| DSF | 3x | North | Upland oaks<br>Yellow-poplar<br>Black cherry | 65–75<br>75–85<br>65–75 | Moderate | Severe | Moderate |
| | 4x | South | Upland oaks<br>White pine | 55–65<br>65–75 | Moderate | Severe | Severe |
| Ernest: | | | | | | | |
| EnB, EnC | 2w | | Upland oaks<br>Yellow-poplar<br>Black cherry | 75–85<br>85–95<br>75–85 | Moderate | Moderate | Slight |
| EnD | 2w | | Upland oaks<br>Yellow-poplar<br>Black cherry | 75–85<br>85–95<br>75–85 | Severe | Moderate | Slight |
| EsC | 2w | | Upland oaks<br>Yellow-poplar<br>Black cherry | 75–85<br>85–95<br>75–85 | Moderate | Moderate | Slight |
| EsD | 2w | | Upland oaks<br>Yellow-poplar<br>Black cherry | 75–85<br>85–95<br>75–85 | Severe | Moderate | Slight |
| Faywood: | | | | | | | |
| FaC, FaD | 3c | | Upland oaks<br>Yellow-poplar | 65–75<br>75–85 | Severe | Severe | Moderate |
| FaE, FaF | 3c | | Upland oaks<br>Yellow-poplar | 65–75<br>75–85 | Severe | Severe | Moderate |
| Fluvaquents, overwash: FO. Highly variable. Onsite determination needed. | | | | | | | |
| Gilpin: | | | | | | | |
| GIB, GIC, GsC | 2o | | Upland oaks<br>Yellow-poplar<br>Black cherry | 75–85<br>85–95<br>75–85 | Slight | Slight | Slight |
| GID, GIE, GsE | 2r | North | Upland oaks<br>Yellow-poplar<br>Black cherry | 75–85<br>85–95<br>75–85 | Moderate | Moderate | Slight |
| | 3r | South | Upland oaks<br>Yellow-poplar | 65–75<br>75–85 | Moderate | Moderate | Slight |
| GIF, GTF | 2r | North | Upland oaks<br>Yellow-poplar<br>Black cherry | 75–85<br>85–95<br>75–85 | Severe | Severe | Slight |
| | 3r | South | Upland oaks<br>Yellow-poplar | 65–75<br>75–85 | Severe | Severe | Slight |

*management*—Continued

| Factors in management—Continued | | | Preferred species— | | Suitable species— |
|---|---|---|---|---|---|
| Plant competition | | Windthrow hazard | Existing stands | For planting | For Christmas trees |
| Conifers | Hardwoods | | | | |
| Moderate | Slight | Slight | Red oak, black oak, chestnut oak, white pine, Virginia pine. | White pine, Virginia pine, Japanese larch. | White pine, Scotch pine, Norway spruce. |
| Moderate | Moderate | Slight | Red oak, black oak, chestnut oak, white pine, Virginia pine. | White pine, Virginia pine, Japanese larch. | |
| Moderate | Slight | Slight | Red oak, black oak, chestnut oak, white pine, Virginia pine. | White pine, Virginia pine, Japanese larch. | |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, white ash, sugar maple, black walnut. | White pine, yellow-poplar, Norway spruce, Japanese larch. | White pine, Scotch pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, white ash, sugar maple, black walnut. | White pine, yellow-poplar, Japanese larch, Norway spruce. | White pine, Scotch pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, white ash, sugar maple, black walnut. | White pine, yellow-poplar, Norway spruce, Japanese larch. | |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, white ash, sugar maple, black walnut. | White pine, yellow-poplar, Japanese larch, Norway spruce. | |
| Severe | Severe | Slight | Red oak, white oak, black walnut, white ash, Virginia pine. | White pine, Virginia pine, black locust, Japanese larch. | White pine, Scotch pine. |
| Severe | Severe | Slight | Red oak, white oak, black walnut, white ash, Virginia pine. | White pine, Virginia pine, black locust, Japanese larch. | |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, black cherry, white ash, black walnut. | White pine, Virginia pine, yellow-poplar, black walnut, Japanese larch, Norway spruce. | White pine, Scotch pine, Norway spruce. Douglas fir and Fraser fir if elevation is over 2,500 feet. |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, black cherry, white ash, black walnut. | White pine, Virginia pine, yellow-poplar, black walnut, Japanese larch, Norway spruce. | White pine, Scotch pine, Norway spruce. Douglas fir and Fraser fir if elevation is over 2,500 feet. |
| Moderate | Moderate | Slight | Red oak, white oak, yellow-poplar, black cherry, white ash, black walnut. | White pine, Virginia pine, yellow-poplar, black walnut, Japanese larch, Norway spruce. | White pine, Scotch pine, Norway spruce. Douglas fir and Fraser fir if elevation is over 2,500 feet. |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, black cherry, white ash, black walnut. | White pine, Virginia pine, yellow-poplar, black walnut, Japanese larch, Norway spruce. | |
| Moderate | Moderate | Slight | Red oak, white oak, yellow-poplar, black cherry, white ash, black walnut. | White pine, Virginia pine, yellow-poplar, black walnut, Japanese larch, Norway spruce. | |

TABLE 3.—*Wood crops and*

| Soil series and map symbols | Woodland subclass | Aspect | Potential soil productivity | | Factors in management | | |
|---|---|---|---|---|---|---|---|
| | | | Species | Site index | Erosion hazard | Equipment restrictions | Seedling mortality |
| Gilpin-Upshur: | | | | | | | |
| GuC, GuC3 | 3c | | Upland oaks<br>Yellow-poplar<br>Virginia pine | 65–75<br>75–85<br>65–75 | Moderate | Moderate to severe. | Slight |
| GuD, GuD3, GuE, GuE3 | 2c | North | Upland oaks<br>Yellow-poplar<br>Virginia pine | 75–85<br>85–95<br>75–85 | Severe | Severe | Slight |
| | 3c | South | Upland oaks<br>Yellow-poplar<br>Virginia pine | 65–75<br>75–85<br>65–75 | Severe | Severe | Moderate |
| GuF3 | 2c | North | Upland oaks<br>Yellow-poplar<br>Virginia pine | 75–85<br>85–95<br>75–85 | Severe | Severe | Slight |
| | 3c | South | Upland oaks<br>Yellow-poplar<br>Virginia pine | 65–75<br>75–85<br>65–75 | Severe | Severe | Moderate |
| Guernsey: | | | | | | | |
| GyB, GyC | 2w | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Moderate | Moderate | Slight |
| GyD, GyD3 | 2w | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Severe | Moderate | Slight |
| Hackers: Ha | 1o | | Upland oaks<br>Yellow-poplar | 85+<br>95+ | Slight | Slight | Slight |
| Lindside: Ln | 1w | | Upland oaks<br>Yellow-poplar | 85+<br>95+ | Slight | Moderate | Slight |
| Melvin: Me | 1w | | Pin oak | 85+ | Slight | Severe | Severe |
| Monongahela: | | | | | | | |
| MoB | 3w | | Upland oaks<br>Virginia pine | 65–75<br>65–75 | Slight | Moderate | Slight |
| MoC | 3w | | Upland oaks<br>Virginia pine | 65–75<br>65–75 | Moderate | Moderate | Slight |
| Nolin: No | 1o | | Upland oaks<br>Yellow-poplar | 85+<br>95+ | Slight | Slight | Slight |
| Philo: Ph | 1w | | Upland oaks<br>Yellow-poplar | 85+<br>95+ | Slight | Moderate | Slight |
| Pope: Po | 2o | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Slight | Slight | Slight |
| Rayne: RaB, RaC | 2o | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Slight | Slight | Slight |

*management*—Continued

| Factors in management—Continued | | | Preferred species— | | Suitable species— |
|---|---|---|---|---|---|
| Plant competition | | Windthrow hazard | Existing stands | For planting | For Christmas trees |
| Conifers | Hardwoods | | | | |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, white ash, black walnut, black locust, sugar maple | White pine, Virginia pine, Norway spruce, black locust, Japanese larch. | White pine, Scotch pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, white ash, black walnut, black locust, sugar maple | White pine, Virginia pine, black walnut, yellow-poplar, black locust. | White pine, Scotch pine, Norway spruce. |
| Moderate | Moderate | Slight | Red oak, black oak, chestnut oak, Virginia pine. | White pine, Virginia pine, Norway spruce, black locust, Japanese larch. | White pine, Scotch pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, white oak, yellow-poplar, white ash, black walnut, black locust, sugar maple. | White pine, Virginia pine, black walnut, yellow-poplar, black locust. | ---------- |
| Moderate | Moderate | Slight | Red oak, black oak, chestnut oak, Virginia pine. | White pine, Virginia pine, Norway spruce, black locust, Japanese larch | ---------- |
| Severe | Moderate | Slight | Red oak, white oak, black oak, yellow-poplar, white ash, black walnut, black locust | White pine, Virginia pine, yellow-poplar, black locust, Japanese larch, Norway spruce. | White pine, Scotch pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, white oak, black oak, yellow-poplar, white ash, black walnut, black locust. | White pine, Virginia pine, yellow-poplar, black locust, Japanese larch, Norway spruce. | White pine, Scotch pine, Norway spruce. |
| Severe | Severe | Slight | Yellow-poplar, red oak, black oak, white ash, black walnut, black locust. | White pine, yellow-poplar, black walnut, black locust, Norway spruce. | White pine, Scotch pine, Norway spruce. |
| Severe | Severe | Slight | Yellow-poplar, red oak, black oak, white ash, black walnut, black locust. | White pine, yellow-poplar, Japanese larch, Norway spruce. | ---------- |
| Severe | Severe | Slight | Pin oak, sycamore, red maple | White pine, Norway spruce. | ---------- |
| Moderate | Slight | Slight | Red oak, black oak, white oak, Virginia pine, white pine, black walnut. | White pine, Virginia pine, Japanese larch, Norway spruce. | White pine, Scotch pine. |
| Moderate | Slight | Slight | Red oak, black oak, white oak, Virginia pine, white pine, black walnut. | White pine, Virginia pine, Japanese larch, Norway spruce. | White pine, Scotch pine. |
| Severe | Severe | Slight | Yellow-poplar, red oak, white oak, white ash, black walnut. | Yellow-poplar, black walnut, Norway spruce, black locust. | ---------- |
| Severe | Severe | Slight | Yellow-poplar, red oak, black oak, white ash, black walnut, red maple. | White pine, yellow-poplar, Norway spruce. | ---------- |
| Severe | Moderate | Slight | Yellow-poplar, red oak, black oak, white ash, black walnut. | White pine, yellow-poplar, black walnut. | ---------- |
| Severe | Moderate | Slight | Red oak, black oak, yellow-poplar, black walnut, white ash, white pine. | White pine, yellow-poplar, black walnut, red pine, Norway spruce, Japanese larch. | White pine, Scotch pine, Norway spruce. Douglas fir and Fraser fir if elevation is over 2,500 feet. |

TABLE 3.—*Wood crops and*

| Soil series and map symbols | Woodland subclass | Aspect | Potential soil productivity | | Factors in management | | |
|---|---|---|---|---|---|---|---|
| | | | Species | Site index | Erosion hazard | Equipment restrictions | Seedling mortality |
| Strip mines: Sm.<br>Highly variable. Onsite determination needed. | | | | | | | |
| Tygart: Tg | 2w | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Slight | Severe | Moderate to severe. |
| Udifluvents and Fuvaquents: UF | 2w | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Slight | Slight to severe. | Moderate to severe. |
| Upshur:<br>UhC3 | 3c | | Upland oaks<br>Yellow-poplar<br>Virginia pine | 65–75<br>75–85<br>65–75 | Severe | Severe | Moderate |
| UhD3 | 3c | North | Upland oaks<br>Yellow-poplar<br>Virginia pine | 65–75<br>75–85<br>65–75 | Severe | Severe | Slight to moderate. |
| | 4c | South | Upland oaks<br>Virginia pine | 55–65<br>55–65 | Severe | Severe | Moderate |
| Urban land: UL.<br>Not suitable for woodland. | | | | | | | |
| Vandalia:<br>VaB | 3c | | Upland oaks<br>Yellow-poplar<br>Virginia pine | 65–75<br>75–85<br>65–75 | Moderate | Severe | Slight |
| VaC, VaD, VaD3 | 3c | | Upland oaks<br>Yellow-poplar<br>Virginia pine | 65–75<br>75–85<br>65–75 | Severe | Severe | Slight |
| Westmoreland:<br>WmC, WmC3 | 2o | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Slight | Slight | Slight |
| WmD, WmD3, WmE, WmE3 | 2r | North | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Moderate | Moderate | Slight |
| | 3r | South | Upland oaks<br>Yellow-poplar | 65–75<br>75–85 | Moderate | Moderate | Slight |
| WmF | 2r | North | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Severe | Severe | Slight |
| | 3r | South | Upland oaks<br>Yellow-poplar | 65–75<br>75–85 | Severe | Severe | Slight |

*management*—Continued

| Factors in management—Continued | | | Preferred species— | | Suitable species— |
|---|---|---|---|---|---|
| Plant competition | | Windthrow hazard | Existing stands | For planting | For Christmas trees |
| Conifers | Hardwoods | | | | |
| Severe | Severe | Slight | Red oak, black oak, pin oak, yellow-poplar, white ash, red maple. | White pine, Norway spruce, Japanese larch. | |
| Severe | Severe | Slight | Red oak, black oak, yellow-poplar, white ash, red maple. | White pine, Japanese larch. | |
| Severe | Moderate | Slight | Red oak, black oak, white oak, white ash, Virginia pine, black locust. | White pine, Virginia pine, black locust, Japanese larch. | White pine, Scotch pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, black oak, white oak, white ash, Virginia pine. | White pine, Virginia pine, black locust, Japanese larch. | White pine, Scotch pine, Norway spruce. |
| Moderate | Moderate | Slight | Red oak, black oak, white oak, chestnut oak, Virginia pine. | White pine, Virginia pine, Japanese larch. | White pine, Scotch pine. |
| Severe | Moderate | Slight | Red oak, black oak, white oak, yellow-poplar, black walnut, white ash. | White pine, Virginia pine, black walnut, Norway spruce, black locust. | White pine, Scotch pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, black oak, white oak, yellow-poplar, black walnut, white ash. | White pine, Virginia pine, black walnut, Norway spruce, black locust. | White pine, Scotch pine, Norway spruce. |
| Severe | Severe | Slight | Red oak, white oak, black oak, yellow-poplar, white ash, black walnut, black locust. | Yellow-poplar, black walnut, white pine, Norway spruce, Japanese larch. | White pine, Scotch pine, Norway spruce. |
| Severe | Severe | Slight | Red oak, white oak, black oak, yellow-poplar, white ash, black walnut, black locust. | Yellow-poplar, black walnut, white pine, Norway spruce, Japanese larch. | White pine, Scotch pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, white oak, black oak, yellow-poplar, white ash, black walnut, black locust. | White pine, Japanese larch, black locust, yellow-poplar. | White pine, Scotch pine. |
| Severe | Severe | Slight | Red oak, white oak, black oak, yellow-poplar, white ash, black walnut, black locust. | Yellow-poplar, black walnut, white pine, Norway spruce, Japanese larch. | |
| Severe | Moderate | Slight | Red oak, white oak, black oak, yellow-poplar, white ash, black walnut, black locust. | White pine, yellow-poplar, Virginia pine, Norway spruce, Japanese larch. | |

TABLE 3.—*Wood crops and*

| Soil series and map symbols | Woodland subclass | Aspect | Potential soil productivity | | Factors in management | | |
|---|---|---|---|---|---|---|---|
| | | | Species | Site index | Erosion hazard | Equipment restrictions | Seedling mortality |
| Wharton: | | | | | | | |
| WrC | 2w | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Moderate | Moderate to severe. | Moderate |
| WrD | 2w | | Upland oaks<br>Yellow-poplar | 75–85<br>85–95 | Severe | Severe | Moderate |
| Zoar: | | | | | | | |
| ZoB | 3w | | Upland oaks<br>Virginia pine | 65–75<br>65–75 | Slight | Moderate | Moderate |
| ZoC | 3w | | Upland oaks<br>Virginia pine | 65–75<br>65–75 | Moderate | Moderate | Moderate |

consecutively by classes 2, 3, 4, and so on, to include the entire site index range of each species or forest type. Only classes 1 through 4 occur in the survey area.

The site index range for the classes is as follows:

Class 1, 85+ for upland oaks; 95+ for yellow-poplar.
Class 2, 75 to 85 for upland oaks; 85 to 95 for yellow-poplar.
Class 3, 65 to 75 for upland oaks; 75 to 85 for yellow-poplar.
Class 4, 55 to 65 for upland oaks; 55 to 65 for Virginia pine.
Class 5, 45 to 55 for upland oaks.
Class 6, 35 to 45 for upland oaks.

Subclasses are designated by adding a small letter, *x*, *w*, *t*, *d*, *c*, *s*, *f*, *r*, or *o*, to the class numeral, for example, 3x. The letter *x* indicates that the soil is restricted or limited by stoniness or rockiness; *w*, excessive wetness; *t*, toxic substances; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, dry and sandy; *f*, high content of coarse fragments; *r*, steep; and *o*, indicates no significant restrictions or limitations for woodland use and management. Some kinds of soils have more than one subclass limitation. Priority in placing each kind of soil into a subclass is in the order that the subclass limitations are listed above. No soils in the area are assigned to subclasses *t*, *d*, or *s*.

In table 3 the soils are also rated according to factors considered in management.

*Erosion hazard* refers to the soil erosion that can occur following cutting and where the soil is exposed along roads, skid trails, fire lanes, and log decking areas. Slope and texture are the main features considered. The erosion hazard is *slight* if potential erosion is unimportant; *moderate* if some attention, such as diversion of water, is needed to prevent accelerated erosion; and *severe* if intensive management is needed to control soil losses. Intensive management is the special care needed in locating and building roads and skid trails; in diverting water during and after logging; and, in some places, in seeding grasses or legumes.

*Equipment restriction* refers to the degree to which the soil and its topographic features restrict the use of equipment commonly used in tree harvesting or cultural work. Soil wetness, size and number of stones, clayey subsoil, and slope are the main restricting factors. The restriction is *slight* if there is little or no limitation on the kind of equipment or the time of year equipment is used and if slopes are generally less than 20 percent. The restriction is *moderate* if the use of equipment is limited by soil wetness for less than 3 months a year, and if slopes generally range from 20 to 40 percent. It is *severe* if the use of equipment is limited by soil wetness for more than 3 months a year, if there are large and numerous stones, or if slopes exceed 40 percent.

*Seedling mortality* refers to the expected degree of failure for natural seedlings or planting stock as influenced by kind of soil, degree of erosion, or other site factors. Plant competition is not considered. Excessive wetness or droughtiness are the main factors considered in this rating. A rating of *slight* means that expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

*Plant competition* is the invasion or growth of undesirable plants if openings are made in the canopy. In the survey area, plant competition is generally more severe for pines than for hardwoods. A rating of *slight* means that competition does not prevent adequate natural regeneration of desirable species; *moderate* means that competition delays, but does not prevent, natural or artificial regeneration; and *severe* means that competition prevents such regeneration unless the site is intensively prepared and maintained by weeding and other measures. Plant competition generally increases with increasing productivity and wetness of soils.

*Windthrow hazard* is evaluated by considering soil characteristics that control development of tree roots and therefore affect how firmly trees stand against winds. Depth to bedrock or other root-restricting layers is considered. A rating of *slight* indicates no special problems; *moderate* means that root development is adequate for stability except during periods of excessive soil wetness or periods of strong wind velocity; and *severe* means that the depth to which tree roots

*management*—Continued

| Factors in management—Continued | | | Preferred species— | | Suitable species— |
|---|---|---|---|---|---|
| Plant competition | | Windthrow hazard | Existing stands | For planting | For Christmas trees |
| Conifers | Hardwoods | | | | |
| Severe | Moderate | Slight | Red oak, black oak, white oak, yellow-poplar, white ash, black walnut. | Yellow-poplar, white pine, Japanese larch, Norway spruce. | White pine, Scotch pine, Norway spruce. |
| Severe | Moderate | Slight | Red oak, black oak, white oak, yellow-poplar, white ash, black walnut. | Yellow-poplar, white pine, Japanese larch, Norway spruce. | White pine, Scotch pine, Norway spruce. |
| Moderate | Slight | Slight | Red oak, white oak, yellow-poplar, white pine, Virginia pine. | White pine, Virginia pine, Japanese larch. | White pine, Scotch pine. |
| Moderate | Slight | Slight | Red oak, white oak, yellow-poplar, white pine, Virginia pine. | White pine, Virginia pine, Japanese larch. | White pine, Scotch pine. |

TABLE 4.—*Yields per acre from upland oaks, yellow-poplar, and Virginia pine in even-aged, fully stocked natural stands*

[Compiled from USDA Technical Bulletins 356 and 560 and Southeastern Forest Experiment Station Paper 124 (*6*), (*8*), and (*11*). Dashes indicate that the information does not apply or was not available]

| Site index | Age | Upland oaks | | Yellow-poplar | | Virginia pine |
|---|---|---|---|---|---|---|
| | | *Bd ft* [1] | *Cords* [2] | *Bd ft* [3] | *Cords* [4] | *Cords* [5] |
| 50 | 30 | 350 | 6 4 | | | [6]11 0 |
| | 40 | 1,400 | 12 8 | | | [6]15 6 |
| | 50 | 3,250 | 18 8 | | | [6]17 8 |
| | 70 | 8,150 | 29.5 | | | |
| 60 | 30 | 850 | 10.4 | 1,000 | 9.6 | 19.2 |
| | 40 | 3,200 | 18.6 | 2,650 | 15 5 | 26.9 |
| | 50 | 6,300 | 32 9 | 5,600 | 21 3 | 31.4 |
| | 70 | 12,800 | 38.7 | | | |
| 70 | 30 | 1,750 | 14 9 | 2,650 | 15 1 | 33.1 |
| | 40 | 5,500 | 24 6 | 6,780 | 23 2 | 46 3 |
| | 50 | 9,750 | 33 3 | 11,400 | 31.3 | 54 0 |
| | 70 | 17,700 | 47 4 | | | |
| 80 | 30 | 3,350 | 19 9 | 5,500 | 20.8 | 56.7 |
| | 40 | 8,600 | 30.7 | 11,230 | 31 2 | 76 9 |
| | 50 | 18,600 | 40 6 | 17,620 | 41 3 | 92 9 |
| | 70 | 23,100 | 56 1 | | | |
| 90 | 30 | | | 8,710 | 26.6 | |
| | 40 | | | 16,300 | 39.0 | |
| | 50 | | | 24,400 | 51.9 | |
| | 70 | | | | | |
| 100 | 30 | | | 17,150 | 32.4 | |
| | 40 | | | 21,790 | 47.3 | |
| | 50 | | | 32,150 | 61.7 | |
| | 70 | | | | | |

[1] According to ⅛-inch International rule, for stems to a top diameter of 5 inches inside bark.
[2] Unpeeled volume in standard cords of merchantable stems to top diameter of 4 inches outside bark.
[3] According to ⅛-inch International rule, for stems to a top diameter of 6 inches inside bark.
[4] Volume in standard cords of all trees 5 inches or more in diameter breast high and to a top diameter of 6 inches inside bark.
[5] Volume in standard cords of all stems 4 inches or more in diameter breast high and to a top diameter of 4 inches outside bark. Computed from cubic-foot values for 100 percent density stands using a converting factor of 85 cubic feet per standard cord.
[6] Extrapolated from values for site indexes 55 through 80.

extend does not give adequate stability and that individual trees are easily blown over during periods of higher than average wind velocity.

*Species suitability* refers to commercially important species that are preferred in existing stands or in planting and those that are suitable for Christmas trees. The species are not listed in order of priority.

## Wildlife [3]

Harrison and Taylor Counties have fair to good populations of many native wildlife species. Fairly diverse habitat provides food and cover for a variety of nongame mammals, songbirds, and raptors. Game species include deer, turkeys, and most upland game animals and birds.

Deer are well distributed throughout the two counties, and their numbers are increasing. Turkeys are in certain sections, but are rare. Squirrel, grouse, and rabbit are fairly numerous. Quail and woodcock are on limited habitat scattered throughout the survey area. Wetland wildlife are few, and hunting for waterfowl is very limited. Bear are occasionally reported.

The kinds and numbers of wildlife that live in a given area are closely related to land use, to the resulting kinds and patterns of vegetation, and to the supply and distribution of water. These, in turn, are generally related to the kinds of soil.

Present land use trends in Harrison and Taylor Counties favor the woodland wildlife species. The forest acreage is increasing, and the open farm acreage is decreasing. Prospects for openland wildlife, such as quail and rabbits, depend heavily on future land use.

Wildlife populations depend on the availability of desirable food, water, and cover. Unless the habitat provides these requirements, it cannot support any given species in large numbers. Habitat can be created or improved by fostering the natural establishment of plants, manipulating the existing vegetation, establishing new plantings, and improving the water supply. The ease with which these improvements can be achieved and the magnitude of the improvements are generally related to the kinds of soils.

Table 5 rates the soils of Harrison and Taylor Counties according to their suitability for seven elements of wildlife habitat and for three general kinds of wildlife (*1*).

The suitability ratings can help in—

1. Planning the broad use of parks, refuges, nature-study areas, and other recreational developments for wildlife.
2. Selecting the better soils for creating, improving, or maintaining specific kinds of wildlife habitat elements.
3. Determining the relative intensity of management needed for individual habitat elements.
4. Eliminating sites that would be difficult or impractical to manage for specific kinds of wildlife.
5. Determining areas that are suitable for acquisition for use by wildlife.

### *Habitat elements*

The seven habitat elements considered important are defined in the paragraphs that follow.

*Grain and seed crops* are seed-producing annuals, such as corn, sorghum, wheat, barley, oats, millet, buckwheat, cowpeas, and other plants commonly grown for grain or for seed. The major soil properties affecting this habitat element are effective root depth, available water capacity, natural drainage, slope, surface stoniness, hazard of flooding, and texture of the surface layer and subsoil.

*Domestic grasses and legumes* are domestic perennial grasses and herbaceous legumes that are established by planting and that furnish wildlife food and cover. Among the plants are bluegrass, fescue, brome, timothy, orchardgrass, reed canarygrass, clover, and alfalfa. The major soil properties affecting this habitat element are effective root depth, available water capacity, natural drainage, slope, surface stoniness, hazard of flooding, and texture of the surface layer and subsoil.

*Wild herbaceous plants* are native or introduced perennial grasses and weeds that are generally established naturally. Examples are bluestem, quackgrass, panicgrass, goldenrod, wild carrot, nightshade, and dandelion. The plants provide food and cover principally to upland forms of wildlife. The major soil properties affecting this habitat element are effective root depth, available water capacity, natural drainage, surface stoniness, hazard of flooding or ponding, and texture of the surface layer and subsoil.

*Hardwood trees* are nonconiferous trees, shrubs, and woody vines that produce nuts or other fruits, buds, catkins, twigs, or foliage that wildlife eat. They are generally established naturally, but are also planted. Among the native kinds are oak, cherry, maple, poplar, apple, hawthorn, dogwood, persimmon, sumac, sassafras, hazelnut, black walnut, hickory, sweetgum, bayberry, blueberry, huckleberry, blackhaw, viburnum, grape, and briers. The major soil properties affecting this habitat element are effective root depth, available water capacity, and natural drainage.

Also in this group are several varieties of fruit-bearing shrubs that are raised commercially for planting. Autumn-olive, Amur honeysuckle, Tartarian honeysuckle, crabapple, highbush cranberry, and silky cornel dogwood are some of the shrubs that are generally available and can be planted on soils that are rated well suited. Hardwoods that are not available commercially can generally be transplanted successfully.

*Coniferous plants* are cone-bearing evergreen trees and shrubs that provide cover for wildlife. They also provide browse and seeds or fruitlike cones Examples are Norway spruce, Virginia pine, loblolly pine, shortleaf pine, pond pine, Scotch pine, redcedar, and Atlantic white-cedar. The plants are generally established naturally in areas where cover of weeds and sod is thin, but they are also planted. The major soil properties affecting this habitat element are effective root depth, available water capacity, and natural drainage.

*Wetland plants* are wild, herbaceous, annual and perennial plants that grow on moist to wet sites, exclusive of submerged or floating aquatics. They produce food and cover extensively used mainly by wetland forms of wildlife. Examples are smartweed, wild millet, bulrush, sedges, barnyardgrass, duck millet, arrowarum, pickerelweed, waterwillow, wetland grasses, wildrice, and cattails The major soil properties affecting this habitat element are natural drainage, surface stoniness, slope, and texture of the surface layer and subsoil.

*Shallow water areas* are areas of shallow water, generally less than 5 feet deep, near food and cover for wetland wild-

[3] GARY A. GWINN, field biologist, Soil Conservation Service, helped prepare this section.

life. They are natural wet areas or those created by dams or levees or by water-control devices in marshes or streams. Examples are wildlife ponds, beaver ponds, muskrat marshes, waterfowl feeding areas, and wildlife watering developments. The major soil properties affecting this habitat element are depth over bedrock, natural drainage, slope, surface stoniness, and permeability. Natural wet areas that are aquifer fed are rated on the basis of drainage class without regard to permeability. Permeability applies only in a nonaquifer area that has a potential for development and an offsite water supply.

### *Kinds of wildlife*

*Openland wildlife* are birds and mammals that commonly live in areas of cropland, pasture, meadow, and lawns and in areas overgrown with grasses, herbs, shrubs, and vines. Examples are quail, pheasant, meadowlark, field sparrow, dove, cottontail rabbit, red fox, and woodchuck.

*Woodland wildlife* are birds and mammals that obtain food and cover in stands of hardwoods or coniferous trees, shrubs, or a mixture of these plants. Examples are ruffed grouse, woodcock, thrush, vireo, scarlet tanager, gray squirrel, gray fox, white-tailed deer, raccoon, and wild turkey.

*Wetland wildlife* are birds and mammals that commonly live in wet areas, such as ponds, marshes, and swamps. Examples are ducks, geese, rails, herons, shore birds, and muskrat.

Each rating under "Kinds of Wildlife" in table 5 is based on the ratings listed for the habitat elements in the first part of the table. For openland wildlife the rating is based on the ratings shown for grain and seed crops, domestic grasses and legumes, wild herbaceous upland plants, and either hardwood woody plants or coniferous woody plants. The rating for woodland wildlife is based on the ratings listed for domestic grasses and legumes, wild herbaceous upland plants, and either hardwood woody plants or coniferous woody plants. For wetland wildlife the rating is based on the ratings shown for wetland food and cover plants and shallow water areas.

On soils rated *good*, habitat is generally easily created, improved, or maintained. There are few or no soil limitations in habitat management, and satisfactory results are well assured.

On soils rated *fair*, habitat can generally be created, improved or maintained, but limitations are moderate. A moderate intensity of management and fairly frequent attention are required to assure satisfactory results.

On soils rated *poor*, habitat can generally be created, improved, or maintained, but limitations are severe. Management can be difficult, expensive, and intensive. Satisfactory results are questionable.

On soils rated *very poor*, it is impractical to create, improve, or maintain habitat because the limitations are very severe. Unsatisfactory results are probable.

Not considered in the ratings are present land use, the location of a soil in relation to other soils, and the mobility of wildlife.

## Engineering [4]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. It can be used as a guide in planning and in design and construction. Among those who can benefit from this information are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction (*7*). Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan surface and subsurface drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 6, 7, and 8, which show, respectively, estimates of soil properties significant in engineering, interpretations for various engineering uses, and results of engineering laboratory tests on soil samples.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 7 and 9, and it also can be used to make other useful maps.

This information, however, does not eliminate need for further investigation at sites selected for engineering works. Inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some terms have special meanings in soil science that may not be familiar to engineers. The Glossary defines many of these terms.

### *Engineering soil classification systems*

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*3*) used by the SCS engineers, Department of Defense, and others and the AASHTO system (*2*) adopted by the American Association of State Highway and Transportation Officials.

In the Unified system soils are classified according to particle size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified

[4] JAMES L. DOVE, State conservation engineer, Soil Conservation Service, helped prepare this section.

TABLE 5.—*Suitability of the soils for wildlife habitat elements and for kinds of wildlife*

[Udifluvents and Fluvaquents; Fluvaquents, overwash; Strip mines; and Urban land are not rated]

| Soil and map symbol | Wildlife habitat elements | | | | | | | Kinds of wildlife | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Grain and seed crops | Domestic grasses and legumes | Wild herbaceous plants | Hardwood trees and shrubs | Coniferous plants | Wetland plants | Shallow water areas | Openland | Woodland | Wetland |
| Allegheny: | | | | | | | | | | |
| AgC | Fair | Good | Good | Good | Good | Very poor | Very poor | Good | Good | Very poor. |
| AgD | Poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Good | Very poor |
| Atkins: At | Very poor | Poor | Poor | Fair | Fair | Good | Good to fair. | Poor | Good | Good to fair. |
| Chavies: Ch | Good | Good | Good | Good | Good | Poor | Very poor | Good | Good | Very poor. |
| Clarksburg: | | | | | | | | | | |
| ClB, ClC | Fair | Good | Good | Good | Good | Poor to very poor. | Very poor | Good | Good | Very poor. |
| ClD, ClD3 | Poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| Cookport: CoB, CoC | Fair | Good | Good | Good | Good | Very poor | Very poor | Good | Good | Very poor. |
| Culleoka: | | | | | | | | | | |
| CuC | Fair | Good | Good | Good | Good | Very poor | Very poor | Good | Good | Very poor. |
| CuD | Poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| CuE | Very poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| CuE3, CuF3 | Very poor | Poor | Good | Good | Good | Very poor | Very poor | Poor | Good | Very poor. |
| Dekalb: | | | | | | | | | | |
| DeC | Fair | Good | Good | Fair | Fair | Very poor | Very poor | Good | Fair | Very poor. |
| DSF | Very poor | Very poor | Good | Fair | Fair | Very poor | Very poor | Poor | Fair | Very poor. |
| Ernest: | | | | | | | | | | |
| EnB, EnC | Fair | Good | Good | Good | Good | Poor to very poor | Very poor | Good | Good | Very poor. |
| EnD | Poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| EsC, EsD | Very poor | Poor | Good | Good | Good | Very poor | Very poor | Poor | Good | Very poor. |
| Faywood: | | | | | | | | | | |
| FaC | Fair | Good | Good | Good | Good | Very poor | Very poor | Good | Good | Very poor. |
| FaD | Poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| FaE, FaF | Very poor | Poor | Good | Good | Good | Very poor | Very poor | Poor | Good | Very poor. |
| Gilpin: | | | | | | | | | | |
| GlB, GlC | Fair | Good | Good | Good | Good | Very poor | Very poor | Good | Good | Very poor. |
| GlD | Poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| GlE | Very poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Fair | Very poor. |
| GlF, GsC, GsE, GTF | Very poor | Poor | Good | Good | Good | Very poor | Very poor | Poor | Good | Very poor. |
| Gilpin-Upshur: | | | | | | | | | | |
| GuC: | | | | | | | | | | |
| Gilpin part | Fair | Good | Good | Good | Good | Very poor | Very poor | Good | Good | Very poor. |
| Upshur part | Fair | Fair | Fair | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| GuC3, GuD: | | | | | | | | | | |
| Gilpin part | Poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| Upshur part | Poor | Fair | Fair | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| GuD3, GuE: | | | | | | | | | | |
| Gilpin part | Very poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Fair | Very poor |
| Upshur part | Very poor | Fair | Fair | Good | Good | Very poor | Very poor | Poor | Good | Very poor. |
| GuE3, GuF3: | | | | | | | | | | |
| Gilpin part | Very poor | Poor | Good | Good | Good | Very poor | Very poor | Poor | Good | Very poor |
| Upshur part | Very poor | Poor | Fair | Good | Good | Very poor | Very poor | Poor | Fair | Very poor. |
| Guernsey: | | | | | | | | | | |
| GyB, GyC | Fair | Good | Good | Good | Good | Poor to very poor. | Very poor | Good | Good | Very poor. |
| GyD, GyD3 | Poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| Hackers: Ha | Good | Good | Good | Good | Good | Poor | Very poor | Good | Good | Very poor. |
| Lindside: Ln | Poor | Fair | Fair | Good | Good | Poor | Poor | Fair | Good | Poor. |

TABLE 5.—*Suitability of the soils for wildlife habitat elements and for kinds of wildlife*—Continued

| Soil and map symbol | Wildlife habitat elements | | | | | | | Kinds of wildlife | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Grain and seed crops | Domestic grasses and legumes | Wild herbaceous plants | Hardwood trees and shrubs | Coniferous plants | Wetland plants | Shallow water areas | Openland | Woodland | Wetland |
| Melvin: Me | Very poor | Poor | Poor | Fair | Fair | Good | Fair | Poor | Fair | Fair. |
| Monongahela: MoB, MoC | Fair | Good | Good | Good | Good | Poor | Very poor | Good | Good | Very poor. |
| Nolin: No | Fair | Good | Good | Good | Good | Poor | Very poor | Good | Good | Very poor. |
| Philo: Ph | Poor | Fair | Fair | Good | Good | Poor | Poor | Fair | Good | Poor |
| Pope: Po | Fair | Good | Good | Good | Good | Poor | Very poor | Good | Good | Very poor. |
| Rayne: RaB, RaC | Fair | Good | Good | Good | Good | Very poor | Very poor | Good | Good | Very poor. |
| Tygart: Tg | Fair | Fair | Good | Good | Good | Fair | Fair | Fair | Good | Good. |
| Upshur: | | | | | | | | | | |
| UhC3 | Fair | Fair | Fair | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| UhD3 | Poor | Fair | Fair | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| Vandalia: | | | | | | | | | | |
| VaB, VaC | Fair | Good | Good | Good | Good | Very poor | Very poor | Good | Good | Very poor. |
| VaD | Poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Good | Very poor |
| VaD3 | Poor | Poor | Good | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| Westmoreland: | | | | | | | | | | |
| WmC | Fair | Good | Good | Good | Good | Very poor | Very poor | Good | Good | Very poor. |
| WmC3, WmD | Poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| WmD3, WmE | Very poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Good | Very poor |
| WmE3, WmF | Very poor | Poor | Good | Good | Good | Very poor | Very poor | Poor | Good | Very poor. |
| Wharton: | | | | | | | | | | |
| WrC | Fair | Good | Good | Good | Good | Very poor | Very poor | Good | Good | Very poor. |
| WrD | Poor | Fair | Good | Good | Good | Very poor | Very poor | Fair | Good | Very poor. |
| Zoar. ZoB, ZoC | Fair | Good | Good | Good | Good | Poor to very poor. | Very poor | Good | Good | Very poor. |

TABLE 6.—*Estimates of soil properties*

[An asterisk in the first column indicates that at least one mapping unit in the series consists of two or more kinds of soil Because the properties more than. Dashes indicate

| Soil series and map symbols | Depth to seasonal high water table | Depth to bedrock | Depth from surface | USDA texture | Classification | |
|---|---|---|---|---|---|---|
| | | | | | Unified | AASHTO |
| | *Feet* | *Feet* | *Inches* | | | |
| Allegheny: AgC, AgD | >6 | >5 | 0–12 | Silt loam | ML | A–4 |
| | | | 12–35 | Clay loam | ML, CL | A–4, A–6 |
| | | | 35–52 | Sandy loam, gravelly sandy loam | SM, SC, GM, GC, ML | A–2, A–4, A–6 |
| Atkins: At [1] | <½ | >4 | 0–11 | Silt loam | ML, CL | A–4, A–6 |
| | | | 11–48 | Silt loam, light silty clay loam | ML, CL | A–4, A–6 |
| | | | 48–56 | Stratified light silty clay loam, loam, silt loam | ML, CL, SM | A–4, A–6 |
| Chavies: Ch [2] | >3 | >5 | 0–7 | Fine sandy loam | SM, ML | A–2, A–4 |
| | | | 7–36 | Fine sandy loam, heavy fine sandy loam. | SM, ML | A–2, A–4 |
| | | | 36–53 | Stratified fine sandy loam, loamy sand. | GM, SM, ML | A–2, A–4 |
| Clarksburg: ClB, ClC, ClD, ClD3 | 1½–2 | >5 | 0–8 | Silt loam | ML, CL | A–4, A–6 |
| | | | 8–32 | Silt loam, silty clay loam | CL, ML | A–6, A–4 |
| | | | 32–52 | Light silty clay loam | CL, ML | A–6, A–4 |
| Cookport: CoB, CoC | 1½–2 | 3½–4 | 0–14 | Silt loam | ML, SM | A–4 |
| | | | 14–26 | Light clay loam, heavy sandy clay loam. | ML, CL, SM | A–4, A–6 |
| | | | 26–42 | Light sandy clay loam, heavy sandy loam. | ML, CL, SM | A–2, A–4 |
| | | | 42 | Soft sandstone | | |
| Culleoka: CuC, CuD, CuE, CuE3, CuF3. | >3 | 2–3 | 0–14 | Silt loam | ML, CL | A–4, A–6 |
| | | | 14–33 | Heavy silt loam, shaly light silty clay loam. | CL, ML | A–4, A–6, A–7 |
| | | | 33–38 | Very shaly silty clay loam | GC, GM | A–2, A–4 |
| | | | 38 | Interbedded siltstone and shale | | |
| Dekalb: DeC, DSF | >4 | 2–3 | 0–11 | Sandy loam, channery sandy loam | SM, ML | A–2, A–4 |
| | | | 11–25 | Channery sandy loam | SM, GM | A–2, A–4 |
| | | | 25–33 | Very channery sandy loam | GM, SM | A–2, A–4 |
| | | | 33 | Sandstone. | | |
| Ernest: EnB, EnC, EnD, EsC, EsD. | 1½–2 | >4 | 0–6 | Silt loam | ML, CL | A–4, A–6 |
| | | | 6–28 | Light silty clay loam, silty clay loam | CL, ML, MH | A–4, A–6, A–7 |
| | | | 28–53 | Channery silty clay loam, channery heavy silt loam. | CL, ML | A–4, A–6 |
| Faywood: FaC, FaD, FaE, FaF | >3 | 2–3 | 0–5 | Silty clay loam | ML, CL, MH | A–4, A–6 |
| | | | 5–30 | Silty clay, heavy silty clay | CH, MH, CL | A–6, A–7 |
| | | | 30 | Siltstone. | | |
| Fluvaquents: FO [1] | <1 | >4 | 0–50 | Variable gravelly sandy loam to silty clay loam. | | |
| *Gilpin: GlB, GlC, GlD, GlE, GlF, GsC, GsE, GTF, GuC, GuC3, GuD, GuD3, GuE, GuE3, GuF3. For Upshur part of GuC, GuC3, GuD, GuD3, GuE, GuE3, and GuF3, see Upshur series. | >3 | 2–3 | 0–5 | Silt loam | ML | A–4 |
| | | | 5–22 | Light silty clay loam, channery light silty clay loam. | ML, CL, SM, SC | A–4, A–6 |
| | | | 22–32 | Very channery silt loam | ML, CL, GM, SM | A–2, A–4, A–6 |
| | | | 32 | Siltstone and fine grained sandstone. | | |
| Guernsey: GyB, GyC, GyD, GyD3 | 1½–2 | 3½–6 | 0–8 | Silt loam | ML, CL | A–4, A–6 |
| | | | 8–18 | Light silty clay loam, heavy silty clay loam. | ML, CL, CH | A–4, A–6, A–7 |
| | | | 18–34 | Silty clay | ML, MH, CH | A–6, A–7 |
| | | | 34–60 | Shaly clay, shaly silty clay | MH, CH | A–6, A–7 |

*significant in engineering*

and limitations of such soils can vary, the references in this column should be carefully noted. The symbol < means less than, and > means estimate was not made]

| Coarse fraction greater than 3 inches | Percentage passing sieve— | | | | Permeability | Available moisture capacity | Reaction | Shrink-swell potential |
|---|---|---|---|---|---|---|---|---|
| | Number 4 (4 7 mm) | Number 10 (2.0 mm) | Number 40 (0.42 mm) | Number 200 (0.074 mm) | | | | |
| *Percent* | | | | | *Inches per hour* | *Inches per inch of soil* | | |
| | 90–100 | 85–100 | 75–100 | 60–95 | 0 6–2 0 | 0.12–0 18 | | Low. |
| | 80–100 | 85–100 | 75–95 | 55–80 | 0 6–2 0 | 0.12–0 18 | 4 5–5 5 | Low. |
| 0–5 | 65–100 | 60–100 | 40–95 | 30–75 | 0 6–2 0 | 0 12–0 15 | 4 5–5 5 | Low. |
| | 90–100 | 85–100 | 85–100 | 75–95 | 0 6–2 0 | 0 18–0 24 | | Low |
| 0–5 | 90–100 | 85–100 | 80–100 | 60–85 | 0 06–0 6 | 0 12–0 18 | 4 5–5 5 | Moderate to low. |
| 0–15 | 70–100 | 65–100 | 55–95 | 45–85 | 0 2–0 6 | 0.08–0.12 | 4.5–5.5 | Low. |
| | 90–100 | 70–100 | 60–100 | 30–60 | 2 0–6 0 | 0 08–0 15 | | Low. |
| | 90–100 | 70–100 | 60–100 | 30–60 | 2 0–6 0 | 0 08–0.12 | 5 1–6 0 | Low. |
| 0–5 | 55–100 | 55–100 | 50–95 | 25–55 | 2 0–6 0 | 0.08–0.12 | 5 1–6 0 | Low. |
| | 90–100 | 85–100 | 80–95 | 75–90 | 2 0–6 0 | 0.15–0 18 | | Low |
| 0–5 | 85–100 | 85–100 | 70–95 | 60–90 | 0 6–2 0 | 0.12–0 15 | 5 1–6.0 | Moderate. |
| 0–10 | 80–100 | 80–100 | 65–95 | 55–90 | 0 06–0 2 | 0.08–0.12 | 5.6–6 5 | Moderate. |
| 0–5 | 80–95 | 70–100 | 60–80 | 40–70 | 0 6–6 0 | 0.15–0.18 | | Low. |
| 0–10 | 65–95 | 70–100 | 50–90 | 40–65 | 0 6–2 0 | 0.12–0 15 | 4 5–5 5 | Low. |
| 0–10 | 50–100 | 30–90 | 25–85 | 25–80 | 0 06–0 6 | 0 08–0 12 | 4.5–5.5 | Low. |
| 0–5 | 85–100 | 85–100 | 70–90 | 65–85 | 0 6–6.0 | 0.12–0 18 | | Low. |
| 0–10 | 85–100 | 55–85 | 55–80 | 50–75 | 0 6–2 0 | 0.08–0.15 | 5.1–6 0 | Moderate. |
| 0–15 | 25–75 | 20–65 | 20–45 | 15–45 | 0 6–2 0 | 0.08–0.12 | 5 1–6 5 | Moderate. |
| 5–15 | 50–90 | 30–85 | 25–75 | 20–70 | 2 0–6 0 | 0.08–0 15 | | Low. |
| 10–20 | 45–80 | 30–55 | 30–50 | 20–45 | 2 0–6 0 | 0 08–0 12 | 4 5–5.5 | Low. |
| 10–30 | 40–75 | 25–55 | 25–50 | 10–40 | 2 0–6 0 | 0 05–0.08 | 4 5–5 5 | Low. |
| 0–10 | 75–100 | 70–95 | 70–90 | 60–75 | 0.6–6.0 | 0.10–0 16 | | Low. |
| 0–10 | 80–100 | 70–90 | 70–85 | 65–80 | 0 6–2 0 | 0 12–0 18 | 4.5–5.5 | Moderate. |
| 5–15 | 70–95 | 60–85 | 60–80 | 55–75 | 0 06–0 6 | 0 08–0 12 | 4.5–5.5 | Moderate. |
| 0–5 | 90–100 | 80–100 | 80–100 | 75–95 | 0.2–2 0 | 0 18–0.24 | | Moderate to high. |
| 0–10 | 80–100 | 70–100 | 70–100 | 70–90 | 0 06–0.2 | 0 12–0.18 | 5.6–7 3 | High |
| 0–5 | 85–100 | 80–90 | 70–85 | 60–85 | 0 6–2 0 | 0 14–0.18 | | Low. |
| 0–10 | 65–90 | 50–90 | 50–80 | 40–70 | 0 6–2 0 | 0 08–0.14 | 4.5–5 5 | Moderate |
| 0–20 | 40–85 | 20–50 | 15–45 | 15–40 | 0 6–2 0 | 0.06–0.10 | 4 5–5 5 | Low. |
| 0–5 | 90–100 | 90–100 | 80–95 | 80–90 | 0.6–2.0 | 0 14–0 24 | | Low. |
| 0–5 | 90–100 | 90–100 | 85–95 | 80–95 | 0.6–2.0 | 0.10–0.14 | 5 1–6 0 | Moderate. |
| 0–5 | 85–100 | 70–100 | 70–95 | 65–90 | 0.06–0.6 | 0.08–0 12 | 5.6–6 5 | Moderate. |
| 0–5 | 70–95 | 55–90 | 55–90 | 55–90 | 0 06–0.6 | 0.08–0.12 | 5 6–6 5 | Moderate. |

TABLE 6.—*Estimates of soil properties*

| Soil series and map symbols | Depth to seasonal high water table | Depth to bedrock | Depth from surface | USDA texture | Classification | |
|---|---|---|---|---|---|---|
| | | | | | Unified | AASHTO |
| | *Feet* | *Feet* | *Inches* | | | |
| Hackers: Ha [2] | >4 | >6 | 0–17 | Silt loam | ML, CL | A–4, A–6 |
| | | | 17–50 | Light silty clay loam, silt loam | ML, CL | A–4, A–6 |
| | | | 50–70 | Stratified heavy fine sandy loam, fine sandy loam, silt loam. | ML, CL, SM | A–4, A–6 |
| Lindside: Ln [1] | 1½–2 | >5 | 0–10 | Silt loam | ML, CL | A–4, A–6 |
| | | | 10–40 | Heavy silt loam, light silty clay loam | ML, CL | A–4, A–6 |
| | | | 40–60 | Stratified silt loam, sand, fine gravel. | ML, CL, SM, SC | A–4, A–6 |
| Melvin: Me [1] | <½ | >4 | 0–6 | Silt loam | ML, CL | A–4, A–6 |
| | | | 6–46 | Heavy silt loam, silt loam | ML, CL | A–4, A–6 |
| | | | 46–52 | Stratified silt loam, fine sandy loam, loam. | ML, CL, SM | A–4, A–6 |
| Monongahela: MoB, MoC | 1½–2½ | 3½–6 | 0–8 | Silt loam | ML, CL | A–4, A–6 |
| | | | 8–26 | Heavy silt loam | ML, CL | A–4, A–6 |
| | | | 26–56 | Silt loam, clay loam | ML, CL, SM | A–4, A–6 |
| | | | 56–61 | Fine sandy loam | ML, SM | A–4 |
| Nolin: No [1] | >4 | >5 | 0–45 | Silt loam | ML, CL | A–4, A–6 |
| | | | 45–66 | Stratified silt loam and fine sandy loam. | ML, CL, SM | A–4, A–6 |
| Philo: Ph [1] | 1½–2 | >4 | 0–12 | Silt loam | ML | A–4 |
| | | | 12–28 | Fine sandy loam | ML, SM | A–4 |
| | | | 28–50 | Gravelly sandy loam | GM, SM, ML | A–2, A–4 |
| Pope: Po [1] | >4 | >5 | 0–48 | Silt loam, fine sandy loam | ML, SM | A–4 |
| | | | 48–60 | Stratified loamy sand, fine sandy loam, cobbles, gravel. | SM, GM, ML | A–2, A–4 |
| Rayne: RaB, RaC | >3 | >3½ | 0–14 | Silt loam | ML, CL | A–4, A–6 |
| | | | 14–32 | Heavy silt loam, silty clay loam | CL, ML, GM | A–4, A–6 |
| | | | 32–44 | Channery silt loam | GM, SM | A–2, A–4 |
| | | | 44 | Siltstone | | |
| Strip mines: Sm. No valid estimates can be made; material too variable | | | | | | |
| Tygart: Tg | 0–1 | >5 | 0–13 | Silt loam, light silty clay loam | ML, CL | A–4, A–6 |
| | | | 13–32 | Heavy silty clay loam | CL, ML, CH | A–6, A–7 |
| | | | 32–54 | Light silty clay, silty clay | CL, CH | A–6, A–7 |
| *Udifluvents: UF [1] For Fluvaquents part, see Fluvaquents. | 1½–4 | >4 | 0–60 | Variable gravelly sandy loam to silt loam | | |
| Upshur: UhC3, UhD3 | >3 | 3–4 | 0–13 | Silty clay | CL, MH | A–6, A–7 |
| | | | 13–32 | Clay | MH, CH | A–6, A–7 |
| | | | 32–38 | Very shaly silty clay loam | CL, MH, CH | A–6, A–7 |
| | | | 38 | Soft red shale. | | |
| Urban land: UL. No valid estimates can be made; material too variable. | | | | | | |
| Vandalia: VaB, VaC, VaD, VaD3 | >3 | >6 | 0–22 | Silty clay loam | ML, CL | A–4, A–6 |
| | | | 22–46 | Silty clay, channery silty clay | MH, CH, CL | A–6, A–7 |
| | | | 46–55 | Channery silty clay | MH, CH, CL | A–6, A–7 |
| Westmoreland: WmC, WmC3, WmD, WmD3, WmE, WmE3, WmF. | >3 | 3½–4 | 0–8 | Silt loam | ML, CL | A–4, A–6 |
| | | | 8–22 | Channery silty clay loam | ML, CL | A–4, A–6 |
| | | | 22–42 | Very channery silty clay loam | GM, GC, ML, CL | A–2, A–4, A–6 |
| | | | 42 | Shale and sandstone | | |

*significant in engineering*—Continued

| Coarse fraction greater than 3 inches | Percentage passing sieve— | | | | Permeability | Available moisture capacity | Reaction | Shrink-swell potential |
|---|---|---|---|---|---|---|---|---|
| | Number 4 (4 7 mm) | Number 10 (2 0 mm) | Number 40 (0 42 mm) | Number 200 (0.074 mm) | | | | |
| *Percent* | | | | | *Inches per hour* | *Inches per inch of soil* | *pH* | |
| | 90–100 | 90–100 | 80–95 | 65–90 | 2 0–6 0 | 0 18–0 24 | | Low. |
| | 95–100 | 80–100 | 80–100 | 75–95 | 0 6–2 0 | 0 12–0 18 | 5 1–6 0 | Moderate. |
| | 85–100 | 80–90 | 70–80 | 45–80 | 0 6–6 0 | 0 12–0 15 | 5 1–6.0 | Low. |
| | 100 | 95–100 | 90–100 | 75–90 | 0 6–2 0 | 0 18–0.26 | | Low. |
| | 100 | 95–100 | 90–100 | 80–90 | 0.6–2 0 | 0.18–0 24 | 5 6–6 5 | Low. |
| | 90–100 | 85–100 | 50–85 | 40–80 | 0.6–6 0 | 0 12–0 18 | 5 6–6 5 | Low. |
| | 90–100 | 90–100 | 90–100 | 80–95 | 0 6–2 0 | 0 16–0 22 | | Low. |
| | 90–100 | 90–100 | 90–100 | 85–100 | 0 2–0 6 | 0 16–0 22 | 6 5–7.3 | Moderate. |
| | 90–100 | 85–100 | 50–90 | 40–90 | 0 6–6 0 | 0 12–0 18 | 6 5–7 3 | Low |
| | 90–100 | 80–100 | 80–100 | 70–95 | 0.6–2 0 | 0 15–0 21 | | Low. |
| 0–5 | 90–100 | 80–100 | 80–100 | 70–90 | 0 6–2 0 | 0 12–0 18 | 4 5–5 5 | Low. |
| 0–5 | 75–100 | 65–100 | 60–95 | 45–90 | 0 06–0 2 | 0 08–0 12 | 4 5–5 5 | Low |
| 0–10 | 75–100 | 50–85 | 50–90 | 40–85 | 0 6–2 0 | 0 08–0 12 | 4.5–5.5 | Low |
| | 100 | 95–100 | 85–100 | 70–90 | 0 6–2 0 | 0 18–0 24 | 5 6–6 5 | Moderate to low. |
| | 100 | 90–100 | 80–95 | 45–85 | 0 6–6 0 | 0 12–0 15 | 5 6–6 5 | Low |
| | 90–100 | 90–100 | 70–90 | 55–80 | 0.6–6 0 | 0 14–0 18 | | Low. |
| | 85–100 | 70–100 | 70–90 | 45–80 | 0 6–2 0 | 0 08–0 12 | 5.1–6 0 | Low |
| | 75–95 | 65–100 | 40–85 | 30–80 | 0 6–6 0 | 0 06–0.10 | 5.1–6 0 | Low. |
| | 75–100 | 70–100 | 60–85 | 40–75 | 0 6–6.0 | 0 10–0.14 | 4 5–5 5 | Low. |
| 0–5 | 70–100 | 60–100 | 40–85 | 30–70 | 2.0–6.0 | 0 06–0 12 | 4.5–5.5 | Low. |
| | 85–100 | 75–95 | 70–85 | 60–80 | 0 6–2.0 | 0 14–0 18 | | Low |
| | 60–95 | 55–95 | 45–75 | 40–70 | 0 6–2.0 | 0 10–0.16 | 4 5–5 5 | Moderate. |
| | 55–90 | 20–60 | 15–45 | 15–40 | 0 6–2 0 | 0 08–0 12 | 4.5–5 5 | Low. |
| | 95–100 | 90–100 | 90–100 | 70–85 | 0 6–2 0 | 0 16–0.20 | | Low to moderate. |
| | 95–100 | 90–100 | 80–100 | 70–85 | 0.06–0 2 | 0 10–0 14 | 4 5–5 5 | Moderate. |
| | 95–100 | 90–100 | 85–100 | 75–90 | 0 06–0 2 | 0.10–0.14 | 4 5–5 5 | Moderate. |
| | 95–100 | 90–100 | 80–100 | 80–95 | 0 2–0.6 | 0.12–0.16 | | High. |
| | 95–100 | 90–100 | 80–100 | 80–100 | 0 06–0 2 | 0.10–0 14 | 5.1–7.3 | High. |
| | 85–100 | 75–100 | 70–100 | 65–100 | 0.06–0 2 | 0 08–0.12 | 5 6–7.3 | High. |
| | 75–100 | 70–90 | 65–80 | 55–75 | 0.2–0 6 | 0 12–0.18 | | Moderate. |
| | 75–100 | 70–100 | 65–90 | 65–85 | 0.06–0.6 | 0.12–0.15 | 5.1–6.0 | High. |
| | 70–100 | 65–100 | 60–100 | 55–100 | 0 06–0.6 | 0.08–0.12 | 5 1–6 0 | High. |
| 0–5 | 85–100 | 80–100 | 75–95 | 65–85 | 0.6–6 0 | 0.14–0.18 | | Low. |
| 0–10 | 70–100 | 65–100 | 60–90 | 60–85 | 0 6–2 0 | 0.10–0.14 | 5 1–6.0 | Moderate. |
| 5–15 | 30–70 | 25–60 | 20–60 | 20–55 | 0 6–2 0 | 0.08–0.12 | 5 1–6 0 | Low. |

TABLE 6.—*Estimates of soil properties*

| Soil series and map symbols | Depth to seasonal high water table | Depth to bedrock | Depth from surface | USDA texture | Classification | |
|---|---|---|---|---|---|---|
| | | | | | Unified | AASHTO |
| | *Feet* | *Feet* | *Inches* | | | |
| Wharton: WrC, WrD | 1½–2 | 3½–6 | 0–12 | Silt loam | ML, CL | A–4, A–6 |
| | | | 12–30 | Silty clay loam, silty clay | CL, MH, ML | A–6, A–7 |
| | | | 30–51 | Silty clay, silty clay loam | CL, ML, CH, MH | A–6, A–7 |
| | | | 51–72 | Very shaly silt loam | CL, MH, CH | A–6, A–7 |
| | | | 72 | Soft silty shale | | |
| Zoar: ZoB, ZoC | 1½–2½ | >4 | 0–7 | Silt loam | ML, CL | A–4, A–6 |
| | | | 7–24 | Silty clay loam | CL, ML, MH | A–6, A–7 |
| | | | 24–47 | Light silty clay, silty clay | CL, MH, CH | A–6, A–7 |
| | | | 47–62 | Clay | CH, MH | A–6, A–7 |

[1] Subject to periodic flooding.
[2] Rarely subject to flooding.

as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect highway construction and maintenance. A soil is assigned to one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A-1 are gravelly soils, which have high bearing strength and are the best soils for foundation, or subgrade. At the other extreme, in group A-7, are clay soils, which have low strength when wet and are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A-1, A-2, and A-7 groups are divided as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 for the poorest. The AASHTO classification for tested soils, with group index numbers in parentheses, is shown in table 8; the estimated classification, without group index numbers, is given in table 6 for all soils mapped in the survey area.

### *Soil properties significant in engineering*

Estimates of soil properties significant in engineering are given in table 6. They are made for representative soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 6.

Depth to seasonal high water table is distance from the surface of the soil to the highest level that ground water reaches in the soil in most years.

Depth to bedrock is distance from the surface of the soil to the upper surface of the rock layer.

Soil texture is described in table 6 in the standard terms used by the Department of Agriculture. These terms take into account the percentage of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary of this soil survey.

Permeability is the quality that enables a soil to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 6 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available moisture capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Shrink-swell potential is the change in volume to be expected of soil material with changes in moisture content, that is, the extent to which the soil shrinks when dry or swells when wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

### *Engineering interpretations*

The estimated interpretations in table 7 are based on the engineering properties of soils shown in table 6, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Harrison and Taylor Counties. In table 7, ratings indicate suitability of the soils for winter grading and as sources of topsoil and road fill and their susceptibility to hillside slippage and frost action. Table 7 also lists soil features to be considered in planning and in installation and maintenance.

*significant in engineering*—Continued

| Coarse fraction greater than 3 inches | Percentage passing sieve— | | | | Permeability | Available moisture capacity | Reaction | Shrink-swell potential |
|---|---|---|---|---|---|---|---|---|
| | Number 4 (4 7 mm) | Number 10 (2 0 mm) | Number 40 (0.42 mm) | Number 200 (0.074 mm) | | | | |
| *Percent* | | | | | *Inches per hour* | *Inches per inch of soil* | *pH* | |
| 0–5 | 90–100 | 85–100 | 85–95 | 80–90 | 0 6–2 0 | 0 18–0 24 | | Low |
| 0–5 | 90–100 | 90–100 | 85–95 | 80–95 | 0 6–2 0 | 0.12–0 18 | 4 5–5 5 | Moderate |
| 0–5 | 90–100 | 85–100 | 80–95 | 75–90 | 0 06–0 6 | 0 08–0 12 | 4 5–5 5 | Moderate |
| 0–10 | 80–100 | 70–95 | 70–90 | 65–90 | 0 06–0 6 | 0 08–0 12 | <4 5–5 0 | Moderate. |
| | 95–100 | 90–100 | 90–100 | 80–90 | 0 6–2 0 | 0 15–0 18 | | Low. |
| | 95–100 | 90–100 | 90–100 | 80–100 | 0 2–0 6 | 0 12–0 15 | 4 5–5 5 | Moderate. |
| | 95–100 | 90–100 | 90–100 | 80–100 | 0 06–0 2 | 0 08–0 12 | 4 5–5 5 | Moderate to high. |
| | 95–100 | 90–100 | 85–100 | 80–100 | 0.06–0 2 | 0 08–0 12 | 4 5–5 5 | Moderate to high. |

Winter grading is affected chiefly by soil features that are relevant to moving, mixing, and compacting soil if roads are built when temperatures are below freezing.

Hillside slippage is associated with ground water, which acts as a lubricant along seepage paths between sloping layers of soil, at the soil and bedrock contacts, at the boundaries of different geologic materials, and along faults or fractures in rock Construction slides, such as highway slides, result from the interception of old existing slides, rapid drainage and drawdown of existing water tables, removal of lateral support from unstable slopes, overloading of weak soils, and recharging of ground water seep paths beyond their capacities. Slides in farming areas occur along seepage planes between contrasting soil layers or at the soil and bedrock contacts in topographic coves or sags in bedrock surface or stratigraphy. The soils subject to slippage are clayey, and their bedrock is dominantly clay shale and pervious interbeds of fractured sandstone, limestone, and coal, which feed ground water to the seep plane. Ratings for hillside slippage are based primarily on the clay content, the underlying bedrock, and the slope of the soil. The ratings are general in nature. A rating of *low* does not mean that slippage cannot occur. Some areas mapped as one kind of soil frequently contain spots of different kinds of soil that could not be separated at the scale of mapping. Onsite determination by geologists and engineers is needed for more precise predictions at construction sites.

Frost action is the heaving caused by the formation of ice lenses in the soil and the subsequent loss of strength caused by excess moisture during thawing periods. Soils that have a higher percentage of silt and very fine sand and the ability to deliver water to a stationary or slowly moving freezing front are highly susceptible to frost action.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil, for example, in preparing a seedbed; either the natural fertility of the soil or response of plants when fertilizer is applied; and the absence of substances toxic to plants. It is also affected by the texture of the soil and the content of stone fragments. Also considered in the ratings is the damage that results in the area from which topsoil is removed.

Road fill is soil material used in embankments for roads. The suitability ratings reflect the predicted performance of soil in an embankment that has been properly compacted and provided with adequate drainage and the ease of excavating the material in borrow areas.

Soil properties that most affect highway and road location are the load-supporting capacity and stability of the subgrade and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil material and the shrink-swell potential indicate traffic-supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for this purpose have low seepage, which is related to permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments and dikes require soil that is resistant to seepage and piping and that has favorable stability, shrink-swell potential, shear strength, and compactibility. Stones or organic material in a soil are unfavorable characteristics.

Drainage of crops and pasture is affected by such soil properties as permeability, texture, and structure; depth to claypan, rock, or other layers that influence rate of water movement; depth to the water table; slope; stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Irrigation of a soil is affected by such features as slope; susceptibility to stream overflow, water erosion, or soil blowing; soil texture; content of stones; accumulations of salts and alkali; depth of root zone; rate of water intake at the surface; permeability of soil layers below the surface layer and in fragipans or other layers that restrict movement of water; amount of water available to plants; and need for drainage, or depth to water table or bedrock.

Terraces and diversions are embankments, or ridges, constructed across the slope to intercept runoff and seepage, which then soak into the soil or flow slowly to a prepared outlet. Features that affect suitability are uniformity and steepness of slope; depth to bedrock or other unfavorable material; presence of stones; permeability; and resistance

TABLE 7.—*Engineering*

[The asterisk in the first column indicates that at least one mapping unit in the series consists of two or more kinds of soil.

| Soil series and map symbols | Suitability for winter grading | Susceptibility to hillside slippage | Potential frost action | Suitability as source of— | | Soil features affecting— |
|---|---|---|---|---|---|---|
| | | | | Topsoil | Road fill | Highway location |
| Allegheny: AgC, AgD | Fair to good. | Low | Moderate | Fair to good. | Fair to good. | Features favorable |
| Atkins: At | Unsuitable | Low | High | Fair to poor. | Fair to poor. | Seasonal high water table at or near surface; flooding. |
| Chavies: Ch | Good to fair. | Low | Moderate | Fair to good. | Fair to good. | Flooding |
| Clarksburg: ClB, ClC, ClD, ClD3. | Poor | Moderate if slope is more than 8 percent. | Moderate | Fair | Fair to poor. | Seasonal high water table at 1½ to 2 feet; seepage; slip hazard |
| Cookport: CoB, CoC | Poor | Low | Moderate | Fair | Fair | Seasonal high water table at 1½ to 2 feet; bedrock at 3½ to 4 feet |
| Culleoka: CuC, CuD, CuE, CuE3, CuF3 | Fair | Moderate if slope is more than 15 percent. | Moderate | Fair to good. | Fair | Rippable bedrock at 2 to 3 feet; slip hazard. |
| Dekalb: | | | | | | |
| DeC | Good | Low | Low | Poor | Good to fair. | Bedrock at 2 to 3 feet |
| DSF | Good | Low | Low | Poor | Good to fair. | Bedrock at 2 to 3 feet; stones. |
| Ernest: | | | | | | |
| EnB, EnC, EnD | Poor | Moderate if slope is more than 8 percent. | Moderate | Fair | Fair to poor. | Seasonal high water table at 1½ to 2 feet; seepage; slip hazard. |
| EsC, EsD | Poor | Moderate if slope is more than 8 percent. | Moderate | Poor | Fair to poor. | Seasonal high water table at 1½ to 2 feet; seepage; slip hazard. |

*interpretations*

Because the properties and limitations of such soils can vary, the reference in this column should be carefully noted]

| Soil features affecting—Continued | | | | | |
|---|---|---|---|---|---|
| Pond reservoir areas | Embankments and dikes | Drainage for crops and pasture | Irrigation | Terraces and diversions | Shallow excavations |
| Pervious substratum | Fair stability; previous layers in substratum. | Well drained | Features favorable | Features favorable | Features favorable. |
| Pervious layers in substratum; seasonal high water table at or near surface; flooding. | Poor stability; erodible. | Seasonal high water table at or near surface; slow to moderately slow permeability; flooding, few available outlets. | Seasonal high water table at or near surface; slow to moderately slow permeability, flooding | Seasonal high water table at or near surface; flooding. | Seasonal high water table at or near surface; flooding. |
| Pervious substratum; flooding. | Fair stability; pervious material. | Well drained | Flooding | Flooding | Flooding. |
| Low seepage losses | Fair stability | Seasonal high water table at 1½ to 2 feet; slow permeability. | Seasonal high water table at 1½ to 2 feet; slow permeability; moderate available moisture capacity. | Seasonal high water table at 1½ to 2 feet; seepage; erodible. | Seasonal high water table at 1½ to 2 feet; slip hazard. |
| Bedrock at 3½ to 4 feet; low seepage losses. | Fair stability | Seasonal high water table at 1½ to 2 feet, moderately slow to slow permeability. | Moderate available moisture capacity; moderately slow to slow permeability. | Seasonal high water table at 1½ to 2 feet; seepage | Seasonal high water table at 1½ to 2 feet; bedrock at 3½ to 4 feet. |
| Rippable bedrock at 2 to 3 feet; pervious substratum. | Fair stability; erodible. | Well drained | Moderate available moisture capacity; bedrock at 2 to 3 feet. | Rippable bedrock at 2 to 3 feet; erodible. | Rippable bedrock at 2 to 3 feet; slip hazard |
| Pervious material; bedrock at 2 to 3 feet | Pervious material | Well drained | Low to moderate available moisture capacity; moderately rapid permeability; bedrock at 2 to 3 feet | Bedrock at 2 to 3 feet. | Bedrock at 2 to 3 feet. |
| Pervious material; bedrock at 2 to 3 feet. | Pervious material | Well drained | Low to moderate available moisture capacity; moderately rapid permeability; bedrock at 2 to 3 feet; stones. | Bedrock at 2 to 3 feet; stones. | Bedrock at 2 to 3 feet; stones |
| Low seepage losses | Fair to poor stability. | Seasonal high water table at 1½ to 2 feet; slow to moderately slow permeability. | Seasonal high water table at 1½ to 2 feet; slow to modedrately slow permeability; moderate available mosture capacity | Seasonal high water table at 1½ to 2 feet, seepage. | Seasonal high water table at 1½ to 2 feet. |
| Low seepage looses | Fair to poor stability; stones. | Seasonal high water table at 1½ to 2 feet; slow to moderately slow permeability. | Seasonal high water table at 1½ to 2 feet; slow to moderately slow permeability; moderate available moisture capacity; stones. | Seasonal high water table at 1½ to 2 feet; seepage; stones. | Seasonal high water table at 1½ to 2 feet; stones. |

TABLE 7.—*Engineering*

| Soil series and map symbols | Suitability for winter grading | Susceptibility to hillside slippage | Potential frost action | Suitability as source of— | | Soil features affecting— |
|---|---|---|---|---|---|---|
| | | | | Topsoil | Road fill | Highway location |
| Faywood: FaC, FaD, FaE, FaF. | Poor | High | Moderate | Fair to poor. | Poor | Bedrock at 2 to 3 feet; high shrink-swell potential; slip hazard. |
| Fluvaquents, overwash: FO. | Unsuitable | Low | Moderate | Poor | Poor | Seasonal high water table at or near surface; flooding. |
| *Gilpin: GIB, GIC, GID, GIE, GIF, GuC, GuC3, GuD, GuD3, GuE, GuE3, GuF3. For Upshur part of GuC, GuC3, GuD, GuD3, GuE, GuE3, and GuF3, refer to Upshur series. | Fair | Low | Moderate | Fair | Fair | Rippable bedrock at 2 to 3 feet. |
| GsC, GsE, GTF | Fair | Low | Moderate | Poor | Fair | Rippable bedrock at 2 to 3 feet. |
| Guernsey: GyB, GyC, GyD, GyD3. | Poor | High | High | Fair to poor. | Fair to poor. | Seasonal high water table at 1½ to 2 feet; slip hazard. |
| Hackers: Ha | Fair | Low | Moderate | Good | Fair | Flooding |
| Lindside: Ln | Poor | Low | Moderate | Fair to good. | Fair | Seasonal high water table at 1½ to 2 feet; flooding. |
| Melvin: Me | Unsuitable | Low | High | Fair | Poor | Seasonal high water table at or near surface; flooding. |
| Monongahela: MoB, MoC | Poor | Low | Moderate | Fair | Fair | Seasonal high water table at 1½ to 2½ feet; seepage. |
| Nolin: No | Fair | Low | Moderate | Good | Fair | Flooding |
| Philo: Ph | Poor | Low | Moderate to high. | Fair to good. | Fair | Seasonal high water table at 1½ to 2 feet; flooding. |
| Pope: Po | Fair | Low | Low to moderate. | Good | Good to fair. | Flooding |

*interpretations*—Continued

| Soil features affecting—Continued | | | | | |
|---|---|---|---|---|---|
| Pond reservoir areas | Embankments and dikes | Drainage for crops and pasture | Irrigation | Terraces and diversions | Shallow excavations |
| Bedrock at 2 to 3 feet. | Poor stability; slip hazard; erodible. | Well drained | Moderate available moisture capacity, slow permeability; bedrock at 2 to 3 feet. | Bedrock at 2 to 3 feet; erodible. | Bedrock at 2 to 3 feet, slip hazard. |
| Pervious layers; seasonal high water table at or near surface; flooding. | Poor to fair stability; pervious material in some areas. | Seasonal high water table at or near surface; permeability variable; flooding; few available outlets. | Seasonal high water table at or near surface; permeability variable; flooding | Seasonal high water table at or near surface; flooding. | Seasonal high water table at or near surface; flooding |
| Rippable bedrock at 2 to 3 feet | Fair stability | Well drained | Moderate to low available moisture capacity; rippable bedrock at 2 to 3 feet. | Rippable bedrock at 2 to 3 feet. | Rippable bedrock at 2 to 3 feet. |
| Rippable bedrock at 2 to 3 feet. | Fair stability; stones; erodible. | Well drained | Moderate to low available moisture capacity; rippable bedrock at 2 to 3 feet; stones. | Rippable bedrock at 2 to 3 feet; stones. | Rippable bedrock at 2 to 3 feet; stones. |
| Low seepage losses | Poor stability; erodible; slip hazard. | Seasonal high water table at 1½ to 2 feet; moderately slow to slow permeability. | Seasonal high water table at 1½ to 2 feet; moderately slow to slow permeability. | Seasonal high water table at 1½ to 2 feet, erodible. | Seasonal high water table at 1½ to 2 feet; slip hazard. |
| Pervious substratum; flooding. | Fair stability | Well drained | Flooding | Flooding | Flooding. |
| Pervious substratum; flooding. | Fair stability | Seasonal high water table at 1½ to 2 feet. | Seasonal high water table at 1½ to 2 feet; flooding. | Seasonal high water table at 1½ to 2 feet; flooding. | Seasonal high water table at 1½ to 2 feet; flooding. |
| Pervious layers in substratum; flooding | Poor stability; erodible. | Seasonal high water table at or near surface; flooding; moderately slow permeability. | Seasonal high water table at or near surface; flooding; moderately slow permeability. | Seasonal high water table at or near surface; flooding | Seasonal high water table at or near surface, flooding. |
| Pervious layers in substratum in some areas | Fair stability | Seasonal high water table at 1½ to 2½ fee , slow permeability. | Seasonal high water table at 1½ to 2½ feet; slow permeability; moderate available moisture capacity | Seasonal high water table at 1½ to 2½ feet; seepage. | Seasonal high water table at 1½ to 2½ feet |
| Pervious substratum; flooding. | Fair stability | Well drained | Flooding | Flooding | Flooding. |
| Pervious substratum; flooding. | Fair stability | Seasonal high water table at 1½ to 2 feet; few available outlets. | Seasonal high water table at 1½ to 2 feet; flooding. | Seasonal high water table at 1½ to 2 feet; flooding. | Seasonal high water table at 1½ to 2 feet; flooding. |
| Pervious material; flooding. | Pervious material | Well drained | Moderate to moderately rapid permeability; flooding. | Flooding | Flooding. |

TABLE 7.—*Engineering*

| Soil series and map symbols | Suitability for winter grading | Susceptibility to hillside slippage | Potential frost action | Suitability as source of— | | Soil features affecting— |
|---|---|---|---|---|---|---|
| | | | | Topsoil | Road fill | Highway location |
| Rayne: RaB, RaC | Fair | Low | Moderate | Good to fair | Fair | Bedrock below 3½ feet |
| Strip mines: Sm. Material too variable; no interpretations. | | | | | | |
| Tygart: Tg | Unsuitable | Low | High | Fair | Poor | Seasonal high water table at 0 to 1 foot. |
| Udifluvents and Fluvaquents: UF. | Fair to poor. | Low | Low | Poor | Good | Seasonal high water table at or near surface in some areas; flooding. |
| Upshur: UhC3, UhD3 | Poor | High | Moderate to high. | Fair to poor | Poor | Rippable bedrock at 3 to 4 feet; slip hazard. |
| Urban land: UL. Material too variable; no interpretations. | | | | | | |
| Vandalia: VaB, VaC, VaD, VaD3. | Poor | High | Moderate to high. | Fair to poor. | Poor | Slip hazard |
| Westmoreland: WmC, WmC3, WmD, WmD3, WmE, WmE3, WmF. | Fair | Moderate | Moderate | Fair to good. | Fair | Bedrock at 3½ to 4 feet; slip hazard |
| Wharton: WrC, WrD | Poor | Moderate | High | Good to fair. | Poor | Seasonal high water table at 1½ to 2 feet; slip hazard. |
| Zoar: ZoB, ZoC | Poor | High | High | Fair | Poor | Seasonal high water table at 1½ to 2½ feet; slip hazard. |

to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provide outlets for runoff and is easy to vegetate.

Shallow excavations for pipelines, sewer lines, phone and power transmission lines, basements, open ditches, and cemeteries generally require digging or trenching to a depth of less than 6 feet. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrop or big stones, and freedom from flooding or a high water table.

### *Engineering test data*

Table 8 contains engineering test data for two soil series in Harrison and Taylor Counties. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Compaction, or moisture-density, data are important in earthwork. If a soil is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted soil increases until the *optimum moisture content* is reached. After that, density decreases with increase in moisture content. The highest dry density obtained in the compactive test is termed *maximum dry density*. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the ma-

*interpretations*—Continued

| Soil features affecting—Continued | | | | | |
|---|---|---|---|---|---|
| Pond reservoir areas | Embankments and dikes | Drainage for crops and pasture | Irrigation | Terraces and diversions | Shallow excavations |
| Bedrock below a depth of 3½ feet; moderate to moderately rapid permeability. | Fair stability; erodible | Well drained | Favorable features | Erodible | Bedrock below 3½ feet. |
| Low seepage losses | Fair stability; erodible. | Seasonal high water table at 0 to 1 foot; slow permeability. | Seasonal high water table at 0 to 1 foot; slow permeability. | Seasonal high water table at 0 to 1 foot; erodible. | Seasonal high water table at 0 to 1 foot. |
| Pervious material; seasonal high water table at or near surface in some areas, flooding | Pervious material | Seasonal high water table at or near surface in some areas; flooding. | Variable available moisture capacity; variable permeability; seasonal high water table at or near surface in some areas; flooding. | Flooding; seasonal high water table at or near surface in some areas. | Seasonal high water table at or near surface in some areas; flooding. |
| Rippable bedrock at 3 to 4 feet; low seepage losses. | Poor stability; slip hazard; erodible. | Well drained | Slow permeability | Erodible | Rippable bedrock at 3 to 4 feet, slip hazard. |
| Low seepage losses | Poor stability; slip hazard; erodible. | Well drained | Slow to moderately slow permeability. | Erodible | Slip hazard. |
| Bedrock at 3½ to 4 feet. | Fair stability, erodible. | Well drained | Favorable features | Erodible | Bedrock at 3½ to 4 feet, slip hazard. |
| Low seepage losses | Fair stability; erodible. | Seasonal high water table at 1½ to 2 feet; slow to moderately slow permeability. | Seasonal high water table at 1½ to 2 feet; slow to moderately slow permeability. | Erodible | Seasonal high water table at 1½ to 2 feet, slip hazard. |
| Low seepage losses | Poor stability; erodible; slip hazard. | Seasonal high water table at 1½ to 2½ feet; slow permeability. | Seasonal high water table at 1½ to 2½ feet; slow permeability. | Seasonal high water table at 1½ to 2½ feet; erodible | Seasonal high water table at 1½ to 2½ feet, slip hazard. |

terial changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from a semisolid to a plastic state; and the liquid limit, 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.

In table 8 the data on liquid limit and plasticity index are based on tests of soil samples.

## Town and Country Planning

Town and country planning is extensive and important in Harrison and Taylor Counties. Sound planning is vital to the success of an individual enterprise and can be even more important in a community or countywide enterprise.

This section describes the effect of soil properties on selected nonfarm uses. It can help community planners, developers, and individual landowners to determine the most suitable use for an area. To find other information useful for this purpose, see the soil maps and other parts of this survey, particularly "Descriptions of the Soils" and "Engineering."

Table 9 lists the estimated degree and kinds of limitation for selected uses. Limitations are expressed as *slight*, *moderate*, or *severe*. If the rating is *moderate* or *severe*, the main limiting property or properties are listed. The ratings are based on the degree of the greatest single limitation. For example, if flooding severely limits the use of a soil in the disposal of sewage effluent from septic tanks, the limitation is rated *severe* even if the soil is well suited to that use in all other respects. A rating of *slight* indicates that the soil has no important limitation to the specific use; *moderate* indicates limitations that should be recognized, but can be overcome or corrected; and *severe* indicates serious limitations that are

TABLE 8.—*Engineering*

[Tests performed by West Virginia University in cooperation with the West Virginia State Road Commission and the U.S. Department of Officials

| Soil name and location | Parent material | Report number S-63 W. Va | Depth | Moisture density [1] | |
|---|---|---|---|---|---|
| | | | | Maximum dry density | Optimum moisture |
| | | | *Inches* | *Percent* | *Percent* |
| Westmoreland silt loam: | | | | | |
| 5 miles N of Bridgeport and 2.5 miles WNW of W. Va Rt. 73 and 300 ft. W. of Corbin Branch Road. Taylor County (Gravelly substratum) | Shale and sandstone of the Monongahela Formation | 46–1–4 | 17–25 | 109 | 19 |
| | | 46–1–6 | 35–45 | 110 | 19 |
| Zoar silt loam: | | | | | |
| 0.25 mile S. of Gypsy and 400 ft. W. of U.S. Hwy. 19. Harrison County (Modal) | Old alluvium | 17–1–4 | 16–24 | 97 | 26 |
| | | 17–1–7 | 37–47 | 100 | 23 |
| | | 17–1–9 | 52–62 | 96 | 25 |

[1] Based on AASHTO Designation: T 99–57, Method A and C.

[2] Mechanical analysis according to the AASHTO Designation: T 88. Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO 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.

difficult to overcome. A *severe* rating, however, does not mean that the soil cannot be used for the specific use (fig. 8).

The information in table 9 applies only to the listed soil as far down as bedrock or to a depth of no more than 4 or 5 feet. It does not apply to the small areas of other soils included within a delineation on the detailed soil map. Ratings shown in table 9 do not eliminate the need for onsite investigation.

The following paragraphs describe the properties considered in rating the soils in table 9.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material is evaluated from a depth of 18 inches to 4 feet or more. Soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Permeability, depth to water table or rock, and susceptibility to flooding affect absorption. Slope affects layout and construction, risk of erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. A lagoon has a nearly level floor, and sides, or embankments, of compacted soil material. It is assumed that the embankment is compacted to medium density and the pond is protected from flooding. Properties considered are those that affect the pond floor and the embankment. Those that affect the pond floor are permeability, organic matter, and slope. If leveling is needed, the depth to bedrock and the condition of the bedrock are also important. Properties that affect the embankment are those designated in the Unified soil classification. Also significant is the number of stones, which influences the ease of excavation and compaction of the embankment material.

Dwellings, as rated in table 9, have basements, are no more than three stories high, and are supported by foundation footings in undisturbed soil. Soil properties considered are those that affect ease of excavation and capacity to support load and resist settlement under load. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks. Those that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential.

Considered in the column "Lawns and landscaping" are properties that affect the establishment of plantings around dwellings. Soil properties should be such that a good lawn can be easily established and maintained if lime and fertilizer are added. Among the properties considered are depth to bedrock, texture, slope, droughtiness, depth to water table, hazard of flooding, and content of coarse fragments.

Local roads and streets, as rated in table 9, have an all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from the soil in place. Most cuts and fills are less than 6 feet deep.

Soil properties that most affect design and construction of roads and streets are the load-supporting capacity and stability of the subgrade and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil and the shrink-swell potential indicate traffic-supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are nearly level and free of coarse fragments and rock outcrop; have good drainage; are not flooded during periods of heavy use; and are firm after rains, but not dusty when dry. If grading and leveling are required, depth to rock is important.

Campsites require little site preparation, other than shaping and leveling for tent and parking areas. They are subject to heavy foot traffic and limited vehicular traffic. The best soils are no more than gently sloping; are well drained; are not flooded during periods of heavy use; and have a surface

*test data*

Commerce, Bureau of Public Roads, in accordance with standard procedures of the American Association of State Highway and Transportation (AASHTO)]

| Mechanical analysis [2] | | | | | | | | Liquid limit | Plasticity index | Classification | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Percentage passing sieve— | | | | Percentage smaller than— | | | | | | | |
| Number 4 (4.7 mm) | Number 10 (2.0 mm) | Number 40 (0.42 mm) | Number 200 (0 074 mm) | 0 05 mm | 0.02 mm | 0 005 mm | 0.002 mm | | | AASHTO [3] | Unified |
| | | | | | | | | *Percent* | | | |
| 89 | 84 | 82 | 74 | 72 | 61 | 37 | 24 | 40 | 14 | A–6(9) | CL–ML. |
| 67 | 59 | 59 | 51 | 46 | 37 | 21 | 14 | 36 | 11 | A–6(4) | CL–ML. |
| ---------- | ---------- | 100 | 96 | 91 | 76 | 47 | 34 | 54 | 21 | A–7–5(15) | MH. |
| ---------- | ---------- | 100 | 98 | 95 | 83 | 52 | 37 | 48 | 18 | A–7–5(13) | ML. |
| ---------- | ---------- | 100 | 97 | 96 | 89 | 66 | 49 | 62 | 29 | A–7–5(20) | MH–CH |

In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

[3] Based on AASHTO Designation: M 145–49

***Figure 8.*—Homesites on Gilpin soil. Good planning and adequate design can overcome many of the moderate and severe limitations, such as slope, depth to bedrock, and seasonal high water table.**

TABLE 9.—*Estimated degree and kinds of*

[A rating of slight indicates few, if any, limitations, moderate indicates limitations that can be overcome

| Soil series and map symbols | Septic tank absorption fields | Sewage lagoons | Dwellings with basements | Lawns and landscaping |
|---|---|---|---|---|
| Allegheny: | | | | |
| AgC | Moderate: slope | Severe: pervious substratum, slope | Moderate: slope | Moderate: slope |
| AgD | Severe: slope | Severe: pervious substratum, slope | Severe: slope | Severe: slope |
| Atkins: At | Severe: seasonal high water table at or near surface; flooding; slow to moderately slow permeability in the subsoil. | Severe: seasonal high water table at or near surface; flooding, pervious substratum. | Severe. seasonal high water table at or near surface, flooding. | Severe: seasonal high water table at or near surface; flooding. |
| Chavies: Ch | Moderate: flooding [1] | Severe: pervious substratum. | Severe: flooding | Slight |
| Clarksburg: | | | | |
| ClB | Severe: seasonal high water table at 1½ to 2 feet; slow permeability. | Moderate: slope | Moderate: seasonal high water table at 1½ to 2 feet; moderate shrink-swell potential. | Moderate: seasonal high water table at 1½ to 2 feet. |
| ClC | Severe: seasonal high water table at 1½ to 2 feet; slow permeability. | Severe: slope | Moderate: seasonal high water table at 1½ to 2 feet, moderate shrink-swell potential; slope. | Moderate: seasonal high water table at 1½ to 2 feet; slope. |
| ClD, ClD3 | Severe: seasonal high water table at 1½ to 2 feet; slow permeability; slope. | Severe: slope | Severe. slope | Severe: slope |
| Cookport: | | | | |
| CoB | Severe: seasonal high water table at 1½ to 2 feet; moderately slow to slow permeability; bedrock at 3½ to 4 feet | Moderate: bedrock at 3½ to 4 feet; slope, sandy layers. | Moderate: seasonal high water table at 1½ to 2 feet; bedrock at 3½ to 4 feet. | Moderate: seasonal high water table at 1½ to 2 feet. |
| CoC | Severe: seasonal high water table at 1½ to 2 feet; moderately slow to slow permeability; bedrock at 3½ to 4 feet. | Severe: slope | Moderate: seasonal high water table at 1½ to 2 feet; bedrock at 3½ to 4 feet; slope. | Moderate: seasonal high water table at 1½ to 2 feet; slope |
| Culleoka: | | | | |
| CuC | Severe: rippable bedrock at 2 to 3 feet | Severe: rippable bedrock at 2 to 3 feet, slope. | Moderate: rippable bedrock at 2 to 3 feet; slope; moderate shrink-swell potential | Moderate: rippable bedrock at 2 to 3 feet; slope. |
| CuD | Severe: rippable bedrock at 2 to 3 feet; slope | Severe. rippable bedrock at 2 to 3 feet; slope. | Severe: slope | Severe: slope |
| CuE, CuE3, CuF3 | Severe: rippable bedrock at 2 to 3 feet; slope. | Severe: rippable bedrock at 2 to 3 feet; slope. | Severe: slope | Severe: slope |
| Dekalb: | | | | |
| DeC | Severe: bedrock at 2 to 3 feet.[1] | Severe: bedrock at 2 to 3 feet; slope, pervious material and substratum. | Severe: bedrock at 2 to 3 feet. | Moderate: bedrock at 2 to 3 feet; slope. |
| DSF | Severe: bedrock at 2 to 3 feet; slope; extremely stony surface.[1] | Severe: bedrock at 2 to 3 feet; slope; pervious material and substratum. | Severe: bedrock at 2 to 3 feet; slope; extremely stony surface. | Severe: slope; extremely stony surface. |
| Ernest: | | | | |
| EnB | Severe: seasonal high water table at 1½ to 2 feet; slow to moderately slow permeability. | Moderate: slope | Moderate: seasonal high water table at 1½ to 2 feet; moderate shrink-swell potential | Moderate: seasonal high water table at 1½ to 2 feet. |

*limitation for town and country planning*

with planning and careful design; severe indicates limitations that are difficult and expensive to overcome]

| Local roads and streets | Playgrounds | Campsites | Picnic areas | Paths and trails |
|---|---|---|---|---|
| Moderate | Severe: slope | Moderate: slope | Moderate: slope | Slight. |
| Severe | Severe: slope | Severe: slope | Severe: slope | Moderate: slope. |
| Severe: seasonal high water table at or near surface; high susceptibility to frost action; flooding. | Severe: seasonal high water table at or near surface; flooding. | Severe: seasonal high water table at or near surface; flooding | Severe: seasonal high water table at or near surface. | Severe: seasonal high water table at or near surface. |
| Moderate: flooding | Slight | Moderate: flooding | Slight | Slight. |
| Moderate: seasonal high water table at 1½ to 2 feet, moderate susceptibility to frost action; moderate shrink-swell potential. | Moderate: seasonal high water table at 1½ to 2 feet; slow permeability; slope. | Moderate: seasonal high water table at 1½ to 2 feet; slow permeability. | Slight | Slight. |
| Moderate: seasonal high water table at 1½ to 2 feet; moderate susceptibility to frost action; slope; moderate shrink-swell potential. | Severe slope | Moderate: seasonal high water table at 1½ to 2 feet; slope; slow permeability | Moderate: slope | Slight |
| Severe: slope | Severe: slope | Severe: slope | Severe: slope | Moderate: slope |
| Moderate: seasonal high water table at 1½ to 2 feet; moderate susceptibility to frost action. | Moderate: seasonal high water table at 1½ to 2 feet; moderately slow to slow permeability, slope. | Moderate: seasonal high water table at 1½ to 2 feet; moderately slow to slow permeability. | Slight | Slight. |
| Moderate: seasonal high water table at 1½ to 2 feet; moderate susceptibility to frost action; slope. | Severe: slope | Moderate: seasonal high water table at 1½ to 2 feet; moderately slow to slow permeability; slope. | Moderate: slope | Slight. |
| Moderate: slope; moderate susceptibility to frost action; moderate shrink-swell potential. | Severe: slope | Moderate: slope | Moderate: slope | Slight. |
| Severe: slope | Severe: slope | Severe: slope | Severe: slope | Moderate: slope. |
| Severe: slope | Severe: slope | Severe: slope | Severe: slope | Severe: slope. |
| Moderate: bedrock at 2 to 3 feet; slope. | Severe: slope | Moderate: slope | Moderate: slope | Slight. |
| Severe: slope | Severe: slope; extremely stony surface. | Severe: slope; extremely stony surface. | Severe: slope | Severe: slope; extremely stony surface. |
| Moderate: seasonal high water table at 1½ to 2 feet; moderate susceptibility to frost action; moderate shrink-swell potential. | Moderate: seasonal high water table at 1½ to 2 feet; slope; slow to moderately slow permeability. | Moderate: seasonal high water table at 1½ to 2 feet; slow to moderately slow permeability. | Slight | Slight. |

TABLE 9.—*Estimated degree and kinds of limitation*

| Soil series and map symbols | Septic tank absorption fields | Sewage lagoons | Dwellings with basements | Lawns and landscaping |
|---|---|---|---|---|
| EnC | Severe: seasonal high water table at 1½ to 2 feet; slow to moderately slow permeability | Severe: slope | Moderate: seasonal high water table at 1½ to 2 feet; moderate shrink-swell potential; slope. | Moderate: seasonal high water table at 1½ to 2 feet; slope |
| EnD | Severe: seasonal high water table at 1½ to 2 feet; slow to moderately slow permeability, slope. | Severe: slope | Severe: slope | Severe: slope |
| EsC | Severe: seasonal high water table at 1½ to 2 feet; slow to moderately slow permeability. | Severe: slope | Moderate: seasonal high water table at 1½ to 2 feet; moderate shrink-swell potential; very stony surface. | Moderate: seasonal high water table at 1½ to 2 feet; very stony surface. |
| EsD | Severe: seasonal high water table at 1½ to 2 feet; slow to moderately slow peremeability; slope. | Severe: slope | Severe. slope | Severe: slope |
| Faywood: | | | | |
| FaC | Severe: bedrock at 2 to 3 feet; slow permeability. | Severe: bedrock at 2 to 3 feet; slope. | Severe: bedrock at 2 to 3 feet; high shrink-swell potential | Severe: bedrock at 2 to feet. |
| FaD | Severe: bedrock at 2 to 3 feet; slow permeability; slope | Severe: bedrock at 2 to 3 feet; slope. | Severe: bedrock at 2 to 3 feet; high shrink-swell potential; slope. | Severe: bedrock at 2 to 3 feet; slope. |
| FaE, FaF | Severe: bedrock at 2 to 3 feet; slow permeability; slope. | Severe: bedrock at 2 to 3 feet; slope. | Severe: bedrock at 2 to 3 feet; high shrink-swell potential; slope. | Severe: bedrock at 2 to 3 feet; slope |
| Fluvaquents, overwash: FO. | Severe: seasonal high water table at or near surface; flooding. [1] | Severe: seasonal high water table at or near surface; flooding; pervious layers in substratum. | Severe: seasonal high water table at or near surface; flooding. | Severe: seasonal high water table at or near surface; flooding. |
| Gilpin: | | | | |
| GIB | Severe: rippable bedrock at 2 to 3 feet.[1] | Severe: rippable bedrock at 2 to 3 feet. | Moderate: rippable bedrock at 2 to 3 feet; moderate shrink-swell potential. | Moderate: rippable bedrock at 2 to 3 feet. |
| GIC | Severe: rippable bedrock at 2 to 3 feet [1] | Severe: rippable bedrock at 2 to 3 feet; slope. | Moderate: rippable bedrock at 2 to 3 feet; slope; moderate shrink-swell potential. | Moderate: rippable bedrock at 2 to 3 feet; slope. |
| GID | Severe: rippable bedrock at 2 to 3 feet; slope.[1] | Severe: rippable bedrock at 2 to 3 feet; slope. | Severe: slope | Severe: slope |
| GIE, GIF | Severe: rippable bedrock at 2 to 3 feet; slope | Severe: rippable bedrock at 2 to 3 feet; slope | Severe: slope | Severe: slope |
| GsC | Severe: rippable bedrock at 2 to 3 feet; slope [1] | Severe: rippable bedrock at 2 to 3 feet; slope. | Moderate: very stony surface. | Moderate: very stony surface. |
| GsE, GTF | Severe: rippable bedrock at 2 to 3 feet; slope. | Severe: rippable bedrock at 2 to 3 feet; slope. | Severe: slope | Severe: slope |
| GuC | Severe: rippable bedrock at 3 to 4 feet; slow permeability. | Severe: slope | Severe: high shrink-swell potential; slip hazard. | Moderate: slope; silty clay loam or silty clay surface layer. |

*for town and country planning*—Continued

| Local roads and streets | Playgrounds | Campsites | Picnic areas | Paths and trails |
|---|---|---|---|---|
| Moderate: seasonal high water table at 1½ to 2 feet; slope, moderate susceptibility to frost action, moderate shrink-swell potential. | Severe: slope | Moderate: seasonal high water table at 1½ to 2 feet; slow to moderately slow permeability; slope. | Moderate: slope | Slight. |
| Severe: slope | Severe: slope | Severe: slope | Severe: slope | Moderate: slope. |
| Moderate: seasonal high water table at 1½ to 2 feet; moderate susceptibility to frost action, moderate shrink-swell potential. | Severe: slope | Moderate: seasonal high water table at 1½ to 2 feet; slow to moderately slow permeability; very stony surface. | Moderate: slope | Moderate: very stony surface |
| Severe: slope | Severe: slope | Severe: slope | Severe: slope | Moderate: very stony surface; slope. |
| Severe: bedrock at 2 to 3 feet; high shrink-swell potential. | Severe: bedrock at 2 to 3 feet; slope | Moderate: slope; silty clay loam surface layer; slow permeability | Moderate: slope; silty clay loam surface layer | Moderate: silty clay loam surface layer. |
| Severe: bedrock at 2 to 3 feet; high shrink-swell potential; slope; slip hazard. | Severe: bedrock at 2 to 3 feet, slope. | Severe: slope | Severe: slope | Moderate: slope. |
| Severe: bedrock at 2 to 3 feet; high shrink-swell potential, slope; slip hazard. | Severe: bedrock at 2 to 3 feet; slope. | Severe: slope | Severe: slope | Severe: slope. |
| Severe: seasonal high water table at or near surface; flooding. | Severe: seasonal high water table at or near surface; flooding. | Severe: seasonal high water table at or near surface; flooding. | Severe: seasonal high water table at or near surface; flooding | Moderate: seasonal water table at or near surface; flooding. |
| Moderate: moderate susceptibility to frost action; moderate shrink-swell potential. | Moderate: rippable bedrock at 2 to 3 feet; slope. | Slight | Slight | Slight. |
| Moderate: slope; moderate susceptibility to frost action; moderate shrink-swell potential. | Severe: slope | Moderate: slope | Moderate: slope | Slight. |
| Severe: slope | Severe: slope | Severe: slope | Severe: slope | Moderate: slope. |
| Severe: slope | Severe: slope | Severe: slope | Severe: slope | Severe: slope. |
| Moderate: slope; moderate shrink-swell potential; moderate susceptibility to frost action. | Severe: slope | Moderate: slope; very stony surface. | Moderate: slope | Moderate: very stony surface. |
| Severe: slope | Severe: slope | Severe: slope | Severe: slope | Severe: slope. Moderate if slope is less than 25 percent. |
| Severe: high shrink-swell potential; moderate to high susceptibility to frost action; slip hazard. | Severe: slope | Moderate: slope; silty clay loam surface layer; slow permeability. | Moderate: slope; silty clay loam surface layer. | Moderate: silty clay loam surface layer. |

TABLE 9.—*Estimated degree and kinds of limitation*

| Soil series and map symbols | Septic tank absorption fields | Sewage lagoons | Dwellings with basements | Lawns and landscaping |
|---|---|---|---|---|
| GuC3 | Severe: rippable bedrock at 3 to 4 feet; slow permeability. | Severe: slope | Severe: high shrink-swell potential; slip hazard. | Moderate: slope; silty clay loam or silty clay surface layer |
| GuD | Severe: rippable bedrock at 3 to 4 feet; slow permeability; slope. | Severe: slope | Severe: high shrink-swell potential; slip hazard; slope. | Severe: slope |
| GuD3 | Severe: rippable bedrock at 3 to 4 feet; slow permeability; slope. | Severe: slope | Severe: high shrink-swell potential; slip hazard; slope | Severe: slope |
| GuE | Severe: rippable bedrock at 3 to 4 feet; slow permeability; slope. | Severe: slope | Severe: high shrink-swell potential; slip hazard; slope. | Severe: slope |
| GuE3, GuF3 | Severe: rippable bedrock at 3 to 4 feet; slow permeability; slope. | Severe: slope | Severe: high shrink-swell potential; slip hazard; slope. | Severe: slope |
| Guernsey: | | | | |
| GyB | Severe: seasonal high water table at 1½ to 2 feet; moderately slow to slow permeability. | Moderate: slope; bedrock at 3½ to 5 feet. | Moderate: seasonal high water table at 1½ to 2 feet; moderate shrink-swell potential. | Moderate: seasonal high water table at 1½ to 2 feet. |
| GyC | Severe: seasonal high water table at 1½ to 2 feet; moderately slow to slow permeability. | Severe: slope | Moderate: seasonal high water table at 1½ to 2 feet; moderate shrink-swell potential; slope. | Moderate: seasonal high water table at 1½ to 2 feet; slope |
| GyD, GyD3 | Severe: seasonal high water table at 1½ to 2 feet; moderately slow to slow permeability; slope. | Severe: slope | Severe: slope | Severe: slope |
| Hackers: Ha | Moderate: flooding [1] | Severe: pervious substratum. | Severe: flooding | Slight |
| Lindside: Ln | Severe: flooding; seasonal high water table at 1½ to 2 feet. | Severe: flooding; seasonal high water table at 1½ to 2 feet; pervious substratum. | Severe: flooding; seasonal high water table at 1½ to 2 feet. | Moderate: flooding |
| Melvin: Me | Severe: flooding; seasonal high water table at or near surface; moderately slow permeability in the subsoil. | Severe: flooding; seasonal high water table at or near surface; pervious layers in substratum. | Severe: flooding; seasonal high water table at or near surface. | Severe: flooding; seasonal high water table at or near surface. |
| Monongahela: | | | | |
| MoB | Severe: seasonal high water table at 1½ to 2½ feet; slow permeability. | Moderate: slope; pervious layers in some areas. | Moderate: seasonal high water table at 1½ to 2½ feet. | Moderate: seasonal high water table at 1½ to 2½ feet. |
| MoC | Severe: seasonal high water table at 1½ to 2½ feet; slow permeability. | Severe: slope | Moderate: seasonal high water table at 1½ to 2½ feet; slope. | Moderate: seasonal high water table at 1½ to 2½ feet; slope. |
| Nolin: No | Severe: flooding [1] | Severe: flooding | Severe: flooding | Moderate: flooding |
| Philo: Ph | Severe: flooding; seasonal high water table at 1½ to 2 feet. | Severe: flooding; pervious substratum. | Severe: flooding; seasonal high water table at 1½ to 2 feet. | Moderate: flooding; seasonal high water table at 1½ to 2 feet. |

*for town and country planning*—Continued

| Local roads and streets | Playgrounds | Campsites | Picnic areas | Paths and trails |
|---|---|---|---|---|
| Severe: high shrink-swell potential; moderate to high susceptibility to frost action, slip hazard. | Severe: silty clay surface layer | Severe: silty clay surface layer. | Severe: silty clay surface layer | Severe: silty clay surface layer |
| Severe: high shrink-swell potential, moderate to high susceptibility to frost action, slip hazard, slope | Severe: slope | Severe: slope | Severe: slope | Moderate: slope. |
| Severe: high shrink-swell potential, moderate to high susceptibility to frost action, slip hazard; slope | Severe: slope; silty clay surface layer. | Severe: slope; silty clay surface layer. | Severe: slope, silty clay surface layer | Severe: silty clay surface layer. |
| Severe: high shrink-swell potential, moderate to high susceptibility to frost action, slip hazard, slope | Severe: slope | Severe: slope | Severe: slope | Severe: slope. |
| Severe: high shrink-swell potential, moderate to high susceptibility to frost action, slip hazard; slope | Severe: slope; silty clay surface layer | Severe: slope, silty clay surface layer. | Severe: slope; silty clay surface layer. | Severe: slope; silty clay surface layer. |
| Severe: high susceptibility to frost action | Moderate: seasonal high water table at 1½ to 2 feet; moderately slow to slow permeability. | Moderate: seasonal high water table at 1½ to 2 feet; moderately slow to slow permeability | Slight | Slight. |
| Severe: high susceptibility to frost action. | Severe: slope | Moderate: seasonal high water table at 1½ to 2 feet; moderately slow to slow permeability; slope | Moderate: slope | Slight |
| Severe: slope | Severe: slope | Severe: slope | Severe: slope | Severe: slope. |
| Moderate: flooding, moderate susceptibility to frost action; moderate shrink-swell potential | Slight | Moderate: flooding | Slight | Slight. |
| Severe: flooding | Severe: flooding | Severe: flooding | Moderate: flooding | Slight |
| Severe: flooding; seasonal high water table at or near surface; high susceptibility to frost action. | Severe: flooding; seasonal high water table at or near surface | Severe: flooding, seasonal high water table at or near surface. | Severe: seasonal high water table at or near surface. | Severe: seasonal high water table at or near surface. |
| Moderate: seasonal high water table at 1½ to 2½ feet; moderate susceptibility to frost action. | Moderate: seasonal high water table at 1½ to 2½ feet; slow permeability; slope. | Moderate: seasonal high water table at 1½ to 2½ feet; slow permeability. | Slight | Slight. |
| Moderate: seasonal high water table at 1½ to 2½ feet; moderate susceptibility to frost action; slope | Severe: slope | Moderate: seasonal high water table at 1½ to 2½ feet, slow permeability; slope. | Moderate: slope | Slight. |
| Severe: flooding | Moderate: flooding | Severe: flooding | Moderate: flooding | Slight. |
| Severe: flooding | Moderate: flooding, seasonal high water table at 1½ to 2 feet | Severe: flooding | Moderate: flooding | Slight |

TABLE 9.—*Estimated degree and kinds of limitation*

| Soil series and map symbols | Septic tank absorption fields | Sewage lagoons | Dwellings with basements | Lawns and landscaping |
|---|---|---|---|---|
| Pope: Po | Severe. flooding [1] | Severe: flooding, pervious material and substratum. | Severe. flooding | Moderate: flooding |
| Rayne | | | | |
| RaB | Moderate· rippable bedrock below 3½ feet. [1] | Moderate: rippable bedrock below 3½ feet; slope. | Moderate: rippable bedrock below 3½ feet | Slight |
| RaC | Moderate: rippable bedrock below 3½ feet, slope. [1] | Severe: slope | Moderate: rippable bedrock below 3½ feet; moderate shrink-swell potential; slope | Moderate: slope |
| Strip mines: Sm. No valid estimates can be made. Material too variable. | | | | |
| Tygart: Tg | Severe: seasonal high water table at 1 foot; slow permeability | Slight | Severe: seasonal high water table at 1 foot | Severe: seasonal high water table at 1 foot. |
| Udifluvents and Fluvaquents: UF. Limitations for Fluvaquents are the same as for Udifluvents. | Severe: flooding; seasonal high water table at or near the surface in some areas. | Severe: flooding; pervious material and substratum. | Severe: flooding, seasonal high water table at or near surface in some areas. | Severe: flooding; seasonal high water table at or near surface in some areas |
| Upshur· | | | | |
| UhC3 | Severe: rippable bedrock at 3 to 4 feet; slow permeability | Severe: slope | Severe: high shrink-swell potential; slip hazard. | Moderate: slope; silty clay surface layer. |
| UhD3 | Severe: rippable bedrock at 3 to 4 feet; slow permeability, slope. | Severe: slope | Severe: high shrink-swell potential, slip hazard; slope | Severe: slope |
| Urban land: UL. No valid estimates can be made Material too variable. | | | | |
| Vandalia: | | | | |
| VaB | Severe: moderately slow to slow permeability. | Moderate: slope | Severe: high shrink-swell potential. | Moderate: silty clay loam surface layer. |
| VaC | Severe: moderately slow to slow permeability. | Severe: slope | Severe: high shrink-swell potential; slip hazard. | Moderate: silty clay loam surface layer, slope. |
| VaD | Severe: moderately slow to slow permeability; slope. | Severe: slope | Severe: high shrink-swell potential, slope. | Severe: slope |
| VaD3 | Severe: moderately slow to slow permeability; slope. | Severe: slope | Severe: high shrink-swell potential; slope. | Severe: slope |

*for town and country planning*—Continued

| Local roads and streets | Playgrounds | Campsites | Picnic areas | Paths and trails |
|---|---|---|---|---|
| Severe: flooding | Moderate: flooding | Severe: flooding | Moderate: flooding | Slight. |
| Moderate: moderate shrink-swell potential; moderate susceptibility to frost action. | Moderate: slope | Slight | Slight | Slight. |
| Moderate: moderate shrink-swell potential; moderate susceptibility to frost action; slope | Severe: slope | Moderate: slope | Moderate: slope | Slight |
| Severe. seasonal high water table at 1 foot; high susceptibility to frost action | Severe: seasonal high water table at 1 foot. | Severe: seasonal high water table at 1 foot. | Severe: seasonal high water table at 1 foot. | Severe: seasonal high water table at 1 foot. |
| Severe: flooding, seasonal high water table at or near surface in some areas. | Severe: flooding; seasonal high water table at or near surface in some areas | Severe: flooding | Severe: flooding | Moderate: flooding. |
| Severe: high shrink-swell potential; moderate to high susceptibility to frost action; slip hazard. | Severe: silty clay surface layer, slope. | Severe: silty clay surface layer | Severe: silty clay surface layer. | Severe: silty clay surface layer. |
| Severe: high shrink-swell potential; moderate to high susceptibility to frost action; slip hazard, slope | Severe: silty clay surface layer; slope. | Severe: silty clay surface surface layer; slope. | Severe: silty clay surface layer; slope | Severe: silty clay surface layer. |
| Severe: high shrink-swell potential; moderate to high susceptibility to frost action | Moderate: silty clay loam surface layer; moderately slow to slow permeability | Moderate: silty clay loam surface layer; moderately slow to slow permeability. | Moderate: silty clay loam surface layer. | Moderate: silty clay loam surface layer. |
| Severe: high shrink-swell potential; moderate to high susceptibility to frost action; slip hazard. | Severe: slope | Moderate: silty clay loam surface layer; moderately slow to slow permeability; slope. | Moderate: silty clay loam surface layer, slope. | Moderate: silty clay loam surface layer. |
| Severe: high shrink-swell potential; moderate to high susceptibility to frost action; slope. | Severe: slope | Severe: slope | Severe: slope | Moderate: silty clay loam surface layer; slope. |
| Severe: high shrink-swell potential; moderate to high susceptibility to frost action; slope. | Severe: slope | Severe: slope | Severe: slope | Severe: silty clay surface layer. |

TABLE 9.—*Estimated degree and kinds of limitation*

| Soil series and map symbols | Septic tank absorption fields | Sewage lagoons | Dwellings with basements | Lawns and landscaping |
|---|---|---|---|---|
| Westmoreland: | | | | |
| WmC, WmC3 | Moderate: bedrock at 3½ to 4 feet; slope [1] | Severe: slope | Moderate: bedrock at 3½ to 4 feet; slope | Moderate: slope |
| WmD, WmD3, WmE, WmE3 | Severe: slope [1] | Severe: slope | Severe: slope | Severe: slope |
| WmF | Severe: slope | Severe: slope | Severe: slope | Severe: slope |
| Wharton: | | | | |
| WrC | Severe: seasonal high water table at 1½ to 2 feet, slow to moderately slow permeability. | Severe: slope | Moderate: seasonal high water table at 1½ to 2 feet; moderate shrink-swell potential; slope | Moderate: seasonal high water table at 1½ to 2 feet; slope. |
| WrD | Severe: seasonal high water table at 1½ to 2 feet; slow to moderately slow permeability; slope. | Severe: slope | Severe: slope | Severe: slope |
| Zoar: | | | | |
| ZoB | Severe: seasonal high water table at 1½ to 2½ feet; slow permeability. | Moderate: slope | Moderate: seasonal high water table at 1½ to 2½ feet; moderate to high shrink-swell potential | Moderate: seasonal high water table at 1½ to 2½ feet. |
| ZoC | Severe: seasonal high water table at 1½ to 2½ feet, slow permeability | Severe: slope | Moderate: seasonal high water table at 1½ to 2½ feet, moderate to high shrink-swell potential; slope | Moderate: seasonal high water table at 1½ to 2½ feet, slope. |

[1] Ground water contamination in some areas

that is free of rocks and coarse fragments, is firm after rains, but is not dusty when dry.

Picnic areas are subject to heavy foot traffic. Most of the vehicular traffic is confined to access roads. The best soils are firm when wet, but not dusty when dry; are not flooded during the season of use; and do not have slopes or stones that greatly increase the cost of leveling sites or of building access roads (fig. 9).

Design and layout for paths and trails should require little or no cutting and filling. The best soils are at least moderately well drained; are firm when wet, but not dusty when dry; are flooded no more than once during the season of use; have slopes of less than 15 percent; and have few or no rocks or stones on the surface.

## *Formation, Morphology, and Classification of the Soils*

This section briefly describes the major factors of soil formation and explains the morphology of the soils. It also defines the current system of classification and classifies the soils of the counties according to that system.

### Factors of Soil Formation

Soils form through the interaction of five major factors, namely, climate, plant and animal life, parent material, relief, and time. The influence of each factor generally varies from place to place. Local variations in soils are the result of differences in kinds of parent material and in topography and drainage. In places one factor can dominate the formation of a soil and determine most of its properties.

*Climate*.—Climate affects the formation of soils through its influence on the rate of the weathering of rocks and the decomposition of minerals and organic matter. It also affects biological activity in the soils and the leaching and movement of weathered materials.

The climate of Harrison and Taylor Counties is of a humid, continental type, which is marked by large seasonal temperature changes. The annual precipitation is about 40 inches, and the mean annual air temperature is about 52° F. The rainfall is uniform during the growing season of May through September. It averages about 19 inches for the period. For more detailed information on climate, see the section "General Nature of the Area."

*Plant and animal life*.—All living organisms, including vegetation, animals, bacteria, and fungi, are important to soil formation. The vegetation is generally responsible for the amount of organic matter, the color of the surface layer, and the amount of nutrients. Earthworms, cicada, and other burrowing animals help keep the soil open and porous. Bacteria and fungi decompose the vegetation and thus help in releasing nutrients for plant food. In Harrison and Taylor Counties, the native hardwood forests have influenced soil formation more than any other living organism. Man has greatly influenced the soil where he has cleared the forest

*for town and country planning*—Continued

| Local roads and streets | Playgrounds | Campsites | Picnic areas | Paths and trails |
|---|---|---|---|---|
| Moderate: moderate shrink-swell potential; moderate susceptibility to frost action, slope | Severe: slope | Moderate: slope | Moderate: slope | Slight |
| Severe: slope | Severe: slope | Severe· slope | Severe: slope | Moderate: slope. |
| Severe: slope | Severe: slope | Severe: slope | Severe· slope | Severe: slope |
| Severe: high susceptibility to frost action. | Severe: slope | Moderate· seasonal high water table at 1½ to 2 feet; slow to moderately slow permeability; slope | Moderate slope | Slight. |
| Severe: high susceptibility to frost action; slope | Severe: slope | Severe: slope | Severe: slope | Moderate: slope |
| Severe: moderate to high shrink-swell potential; high susceptibility to frost action. | Moderate seasonal high water table at 1½ to 2½ feet, slow permeability, slope. | Moderate: seasonal high water table at 1½ to 2½ feet; slow permeability; slope. | Slight | Slight |
| Severe: moderate to high shrink-swell potential; high susceptibility to frost action | Severe: slope | Moderate· seasonal high water table at 1½ to 2½ feet; slow permeability; slope. | Moderate: slope | Slight |

and plowed the land. He has added fertilizers, mixed some of the soil horizons, and moved soil from place to place.

*Parent material.*—Parent material is the unconsolidated mass from which a soil forms. It determines the mineralogical and chemical composition of the soil and to a large extent the rate at which the soil-forming processes take place.

In Harrison and Taylor Counties the soils formed from residuum in upland areas, from colluvium on foot slopes, from old alluvium on high terraces, and from recent alluvium on low and high flood plains.

The soils formed from residuum are the most extensive and have a wide range of characteristics. Examples are the well-drained, moderately deep Gilpin soils and the deep Rayne soils, both of which formed in acid material weathered from shale, siltstone, and sandstone; the well-drained, moderately deep Faywood soils, which formed in material weathered from interbedded shale, siltstone, and limestone; the well-drained, moderately deep to deep Upshur soils, which formed in limy material weathered from red clay shale that contained some carbonates; and the well-drained, moderately deep Dekalb soils, which formed in acid material weathered from sandstone interbedded in places with siltstone and shale.

Examples of soils formed in colluvium are the moderately well drained, deep Ernest soils, which formed in material moved downslope from acid loamy soils on uplands; and the well-drained, deep Vandalia soils, which formed in material moved downslope from lime-influenced clayey soils on uplands.

Among the soils formed in old alluvium on high terraces are the moderately well drained, deep Monongahela soils, which formed in old alluvium containing much silt; and the somewhat poorly drained, deep Tygart soils, which formed in acid alluvium deposited by slack water containing much clay.

Examples of soils formed in recent alluvium on low flood plains are the lime-influenced Nolin soils and the acid Pope soils. Soils formed in recent alluvium on high flood plains are the acid Chavies soils and the lime-influenced Hackers soils.

*Relief.*—Harrison and Taylor Counties are mostly in the Central Allegheny Plateau province, a dissected plateau within the Monongahela River drainage system. The plateau is generally dissected to a depth of 400 or 500 feet. Most hillsides are steep or very steep. Most ridgetops are narrow and are at an elevation of about 1,400 to 1,500 feet. Valleys are very narrow, except along the West Fork River and the lower reaches of its major tributaries.

The shape of the land surface, commonly called the lay of the land; the slope; and the height of the water table have greatly influenced the formation of soils. Soils formed in sloping areas where runoff is moderate to rapid generally are well drained; have a bright-colored, unmottled subsoil; and in most places are leached to a greater depth than the wetter soils in the same area. In the more gently sloping areas where runoff is slower, the soil is wet for short periods. The wetness is evident in the mottled subsoil. In level areas or slight depressions, where the water table is at or near the surface for long periods, the soils show marked evidence of wetness. They have a gray or dark-colored, thick surface layer and a

*Figure 9.*—**A picnic area planned, designed, and constructed on Westmoreland and Clarksburg soils, on which limitations are moderate and severe.**

strongly mottled or grayish subsoil. Some soils are wet because of a high water table or because of their position on the landscape. Permeability, length, steepness, and configuration of the slopes also influence the kinds of soil that form. Local differences in soils are largely the result of differences in parent material and topography.

*Time.*—The formation of soils requires time for changes to take place in the parent material, and this is usually a long time when measured in years. Except for those on flood plains, the soils of Harrison and Taylor Counties have been forming over a long period and are fairly well leached of plant nutrients. An example of an old, highly leached soil is the Monongahela soil on high terraces.

Soils formed on low flood plains, which are subject to varying degrees of overflow, can receive new sediments during each flood. These soils have weak to moderate soil structure and weak color differences between horizons. An example is the Nolin soil, which has been forming for a shorter period than the Monongahela soil and lacks the well-defined horizons typical of that soil.

## Morphology of Soils

The paragraphs that follow briefly describe horizon nomenclature and the processes involved in the formation of well-defined horizons.

*Major soil horizons.*—The results of the soil-forming factors can be distinguished by the different layers, or soil horizons, in a soil profile. The soil profile extends from the surface downward to materials that are little altered by the soil-forming processes.

The three major horizons, which are evident in most soils, are indicated by the letters A, B, and C (*9*). Divisions and changes within each of these major horizons are indicated by numbers and letters. An example is the B2t horizon, which is a B horizon that contains an accumulation of clay.

The A horizon is the surface layer. An A1 horizon is that part of the surface layer that has the largest accumulation of organic matter. The A horizon is also the layer of maximum leaching, or eluviation, of clay and iron. If considerable leaching has taken place and organic matter has not darkened the material, the horizon is called an A2. In the soils of Harrison and Taylor Counties, the oxidation of iron makes the A2 horizon brownish in color.

The B horizon, commonly called the subsoil, underlies the A horizon. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, or other compounds leached from the surface layer. In some soils, it is formed by alteration in place rather than by illuviation. The alteration can be caused by oxidation and reduction of iron or by the weathering of clay minerals. The B horizon commonly has

a subangular blocky, blocky, or prismatic structure and generally is firmer and lighter colored than the A1 horizon.

The C horizon is below the A or B horizon. It consists of materials that are little altered by the soil-forming processes, but can be modified by weathering.

*Processes of soil formation.*—The accumulation of organic matter, the leaching of soluble salts, the reduction and transfer of iron, the formation of soil structure, and the formation and translocation of clay minerals are among the processes involved in the formation of soil horizons These processes are continually taking place, generally at the same time throughout the profile They have been going on for thousands of years.

The accumulation and incorporation of organic matter accompany the decomposition of plant residue. These additions darken the surface layer and help to form the A1 horizon Once lost, organic matter usually takes a long time to replace

In order for soils to have distinct subsoil horizons, it is believed that some of the lime and other soluble salts are leached before the translocation of clay minerals Among the factors that affect this leaching are the kinds of salts originally present, the depth over which the soil solution percolates, and the texture of the soil.

Most of the well drained and moderately well drained soils in Harrison and Taylor Counties have a yellowish-brown, strong-brown, or reddish-brown B horizon. These colors are caused mainly by thin coatings of iron oxides on sand and silt grains In some soils, for example, Upshur soils, the colors are from the reddish shale bedrock from which these soils formed Moderate to strong development of subangular blocky structure has taken place, and the subsoil contains more clay than the overlying surface horizon.

A fragipan has formed in the subsoil of most of the moderately well drained soils on uplands, foot slopes, and terraces. The pan is firm to very firm and brittle when moist and hard to very hard when dry. Because soil particles are tightly packed, bulk density is high and the percentage of pore space is low. The genesis of the fragipan is not fully understood, but studies show that the swelling and shrinking takes place in alternating wet and dry periods. This process could account for the packing of soil particles and also for a gross polygonal pattern of cracks in the fragipan. Clay, silica, and oxides of aluminum are the most likely cementing agents causing brittleness and hardness.

The reduction and transfer of iron is associated mainly with the wetter, more poorly drained soils. This process is called gleying. Moderately well drained to somewhat poorly drained soils have yellowish-brown and reddish-brown mottles, which indicate the segregation of iron. In poorly drained soils, such as Atkins and Melvin soils, the subsoil and underlying material are a grayish color, which indicates reduction and transfer of iron

## Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodland; in developing rural areas; in engineering work; and in many other ways. Soils are assigned to broad classes to facilitate study and comparison in large areas, such as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965 (*10*). It is under continual study. Readers interested in development of the current system should search the latest literature available.[5]

The current system of classification has six categories. Beginning with the broadest, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria used as a basis for classification are soil properties that are observable and measurable The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped together. In table 10, the soil series of Harrison and Taylor Counties are assigned to four categories of the current system. Categories of this system are briefly defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The properties used to differentiate among soil orders are those that give broad climatic groupings of soils. Two exceptions are the Entisols and Histosols, which occur in many different climates. Each order is named with a word ending in *sol* (Entisol).

SUBORDER. Each order is divided into suborders primarily on the basis of those soil characteristics that produce classes that have the greatest genetic similarity These characteristics reflect either the presence or absence of waterlogging or differences in climate or vegetation. The suborders narrow the broad climatic range of the orders. Each suborder is named with a word, the last syllable of which indicates the order. An example is Aquent (*Aqu*, meaning water or wet, and *ent*, from Entisol).

GREAT GROUP Each suborder is divided into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons are those in which clay, iron, or humus have accumulated; those that have pans that interfere with growth of roots, movement of water, or both; and those that have thick, dark-colored surface horizons. The features are the self-mulching properties of clay; the soil temperature; the major differences in the content of calcium, magnesium, sodium, and potassium; and the dark-red and dark-brown colors associated with basic rocks. The names of great groups are made by adding a prefix to the name of the suborder. An example is Fluvaquents (*Fluv*, meaning recent alluvium, *aqu*, meaning water or wet, and *ent*, from Entisols)

SUBGROUP Each great group is divided into subgroups, one representing the central, or typic, segment of the group and others, called intergrades, which have properties of the group, but also one or more properties of another great group, suborder, or order. Subgroups are also made if soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Fluvaquents (a typical Fluvaquent).

FAMILY. Soil families are established within a subgroup

[5] See the unpublished working document "Selected Chapters from the Unedited Text of the Soil Taxonomy" available in the SCS State Office, Morgantown, W Va.

TABLE 10.—*Soil series classified according to the current system of classification*

| Series[1] | Family | Subgroup | Order |
|---|---|---|---|
| Allegheny | Fine-loamy, mixed, mesic | Typic Hapludults | Ultisols. |
| Atkins | Fine-loamy, mixed, acid, mesic | Typic Fluvaquents | Entisols |
| Chavies | Coarse-loamy, mixed, mesic | Ultic Hapludalfs | Alfisols |
| Clarksburg | Fine-loamy, mixed, mesic | Typic Fragiudalfs | Alfisols |
| Cookport | Fine-loamy, mixed, mesic | Aquic Fragiudults | Ultisols. |
| Culleoka | Fine-loamy, mixed, mesic | Ultic Hapludalfs | Alfisols |
| Dekalb | Loamy-skeletal, mixed, mesic | Typic Dystrochrepts | Inceptisols. |
| Ernest | Fine-loamy, mixed, mesic | Aquic Fragiudults | Ultisols |
| Faywood | Fine, mixed, mesic | Typic Hapludalfs | Alfisols |
| Gilpin | Fine-loamy, mixed, mesic | Typic Hapludults | Ultisols. |
| Guernsey | Fine, mixed, mesic | Aquic Hapludalfs | Alfisols |
| Hackers | Fine-silty, mixed, mesic | Typic Hapludalfs | Alfisols |
| Lindside | Fine-silty, mixed, mesic | Fluvaquentic Eutrochrepts | Inceptisols |
| Melvin | Fine-silty, mixed, nonacid, mesic | Typic Fluvaquents | Entisols |
| Monongahela | Fine-loamy, mixed, mesic | Typic Fragiudults | Ultisoils |
| Nolin | Fine-silty, mixed, mesic | Dystric Fluventic Eutrochrepts | Inceptisols |
| Philo | Coarse-loamy, mixed, mesic | Fluvaquentic Dystrochrepts | Inceptisols. |
| Pope | Coarse-loamy, mixed, mesic | Fluventic Dystrochrepts | Inceptisols. |
| Rayne | Fine-loamy, mixed, mesic | Typic Hapludults | Ultisols. |
| Tygart | Clayey, mixed, mesic | Aeric Ochraquults | Ultisols |
| Upshur[2] | Fine, mixed, mesic | Typic Hapludalfs | Alfisols. |
| Vandalia | Fine, mixed, mesic | Typic Hapludalfs | Alfisols |
| Westmoreland | Fine-loamy, mixed, mesic | Ultic Hapludalfs | Alfisols. |
| Wharton | Clayey, mixed, mesic | Aquic Hapludults | Ultisols |
| Zoar | Clayey, mixed, mesic | Aquic Hapludults | Ultisols. |

[1] Fluvaquents and Udifluvents are not classified to the series level.
[2] These soils are shallower over bedrock than those in the defined range of the Upshur series and are therefore considered taxadjuncts to the series

primarily on the basis of properties important to the growth of plants or on the behavior of soils that are used for engineering. Among the properties considered are texture, mineral composition, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. An example is the fine-silty, mixed, nonacid, mesic family of Typic Fluvaquents.

## *General Nature of the Survey Area*

Harrison County was formed from Monongalia County by an act of the General Assembly of Virginia in 1784. The first settlement was in 1773 in the area now called Clarksburg. Taylor County was formed from Harrison, Marion, and Barbour Counties in 1844. The first settlement was in the general area of Pruntytown and Grafton. The first settlers lived mainly by hunting, fishing, and lumbering. They also cleared small tracts to grow corn and wheat and to provide pasture for a few cattle.

When the Northwestern Turnpike, or U.S. Highway 50, from Winchester, Virginia to Clarksburg, West Virginia was completed in 1836, farming began to expand rapidly. When the Baltimore and Ohio Railroad was extended to Clarksburg in 1856, the area gained access to markets on the east coast and overseas and the beef cattle and other farming enterprises grew rapidly. Drilling for oil and gas started around 1880 in Harrison County. The oil and gas industry was important in the industrial development of the two counties, particularly in the Clarksburg area (*4*).

The population of the two counties has been decreasing during the past 20 years or more. According to the 1970 census, the population of Harrison County has decreased about 6 percent since 1960, and that of Taylor County about 8 percent. Clarksburg has decreased about 12 percent since 1960. Bridgeport and Grafton have increased about 14 and 11 percent, respectively, during the same period.

## Climate [6]

The climate of Harrison and Taylor Counties is the humid, continental type, which is characterized by copious, evenly distributed precipitation and a large yearly temperature range. The location of the counties near the windward slopes of the Allegheny Mountains also enhances the ample precipitation. Table 11 provides temperature and precipitation data for the two counties.

The two counties are influenced by cold, dry air masses from the northern part of North America and by warm, humid air masses from the Gulf of Mexico. Thus, the seasonal temperatures contrast sharply. The counties are also affected by the large-scale cyclonic storms, or low-pressure areas, that travel northeastward up the Ohio Valley and are more frequent during the colder half of the year. Day-to-day temperature variations can be large, and weather changes are frequent. Thaws and freezes are common in winter. Three cold waves of near zero or subzero temperatures commonly occur each season, but seldom last more than a few days. An extreme minimum of −16°F can be expected once every 10 years and −21°F once every 25 years.

About 20 to 25 percent of the precipitation in winter is snow. Snowfall averages about 27 inches and usually begins in November. The last snowfall is sometimes as late as April.

Precipitation is evenly distributed throughout the year. It is greater and more intense in summer when the dominant air mass, which is humid, maritime tropical air from the Gulf

[6] By ROBERT O. WEEDFALL, climatologist for West Virginia, National Weather Service, U.S Department of Commerce.

TABLE 11.—*Temperature and precipitation data*

[All data are from Clarksburg, Harrison County, elevation 1,035 feet, for the period 1941–70]

| 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— | | Average number of days with snow cover 1 inch or more | Average depth of snow on days with snow cover |
| | | | Maximum temperature equal to or higher than— | Minimum temperature equal to or lower than— | | Less than— | More than— | | |
| | °F | °F | °F | °F | Inches | Inches | Inches | Number | Inches |
| January | 41 | 21 | 60 | 3 | 3 05 | 1 5 | 5.0 | 8 | 3 |
| February | 43 | 22 | 61 | 6 | 2 76 | 1 1 | 4 3 | 5 | 4 |
| March | 52 | 28 | 72 | 15 | 3 52 | 1 6 | 6 1 | 4 | 2 |
| April | 65 | 38 | 82 | 25 | 3 35 | 1 9 | 5 0 | 1 | 1 |
| May | 75 | 48 | 87 | 35 | 3 77 | 1 7 | 6 4 | 0 | 0 |
| June | 83 | 57 | 92 | 45 | 3 99 | 2 0 | 6 6 | 0 | 0 |
| July | 85 | 61 | 93 | 51 | 4 19 | 1 9 | 7 0 | 0 | 0 |
| August | 84 | 59 | 92 | 49 | 4 11 | 2 0 | 6 5 | 0 | 0 |
| September | 78 | 52 | 89 | 39 | 3 26 | 1 4 | 5 3 | 0 | 0 |
| October | 67 | 40 | 80 | 28 | 2 37 | 0 8 | 4 2 | 0 | 0 |
| November | 54 | 31 | 71 | 18 | 2 65 | 1 1 | 4 5 | 2 | 3 |
| December | 43 | 23 | 62 | 8 | 3 11 | 1 3 | 5 4 | 6 | 3 |
| Year | 64 | 40 | | | 40 19 | 32 5 | 50 5 | 25 | |

of Mexico, interacts with the cool Canadian air and frequently produces a heavy thunderstorm. This cloudburst type of storm is most common in June and July and occurs on an average of 40 days per year. It is sometimes accompanied by violent local winds or hail and intense rainfall. It is dangerous because it can produce a flash flood. Because the terrain in the survey area is a multitudinous network of small watersheds, practically every small basin is subject to this type of flood.

A tornado over the rugged terrain of West Virginia is very rare. Only four have been recorded in Harrison and Taylor Counties.

Humidity measurements are available from Elkins in nearby Randolph County. The average relative humidity at 1 a.m. and 7 a.m. is between 80 and 95 percent. Especially in summer and early in fall, these values reflect the valley fog of the early morning hours. Because the humidity is accompanied by moderate air temperatures, it causes little discomfort. During the rest of the day, the humidity is generally at a comfortable level, and on some sunny afternoons the relative humidity dips into the thirties. Uncomfortably warm and humid afternoons, however, can be expected on a few days in summer.

The climate is favorable for most farm crops commonly grown in the State. The length of the growing season, an average of 164 days, is adequate. Rainfall during the growing season is usually ample and well distributed. Crops are usually not hindered by freezes in late spring or early fall. Table 12 provides data on probabilities of the last freezing temperature in spring and the first in fall. Temperatures of 90°F or above occur on an average of 27 days per year. Cloud cover limits extremely high temperatures, but is associated with higher humidity.

The counties are in a cloudy belt. Possible sunshine is estimated at only about 33 percent in winter and about 60 percent in summer. The average annual number of clear days, or 0 to 30 percent cloud cover, is about 85 and cloudy days, or 80 to 100 percent cloud cover, about 165.

Fall is probably the best season of the year for outdoor activities. October and November are usually the driest months, and warm, cloudless Indian summer days occasionally persist for extended periods. Prolonged dry spells can reduce forage and force farmers to haul water for stock. About 9 days of each fall month are nearly cloudless, and 9 days only partly cloudy.

The prevailing winds most of the year are from westerly directions. Strong winds that cause damage commonly precede intense, large-scale cyclonic storms or low-pressure areas. On the average, however, windflow is generally light, and calm winds prevail during the night and early morning, particularly in valleys.

## Relief and Drainage

The survey area is a highly dissected plateau. Most of the streams flow in narrow, V-shaped valleys. Narrow ridges and steep hillsides are common. Many hillsides are broken by a system of benches. Ridgetops are uniform in elevation, except where broken by saddles and high knobs. Along the larger streams above the present flood level are low and high terraces, which indicate the former positions of streams during geologic erosion. The lowest point, 880 feet above sea level, is at the mouth of Bingamon Creek in Harrison County. The highest point, about 2,050 feet above sea level, is near the extreme north corner of Taylor County.

The streams of the area have a dendritic, or branching, drainage pattern. The West Fork River, which flows north near the center of Harrison County, divides the county into nearly equal parts. The Tygart Valley River, which flows north near the center of Taylor County, divides the county into almost equal parts The streams of each county drain into these two rivers. The West Fork and Tygart Valley

TABLE 12.—*Probability of freezing temperatures in spring and fall*

[All data are from Clarksburg, Harrison County, elevation 1,035 feet]

| Probability | Dates for given probability and temperature | | | | |
|---|---|---|---|---|---|
| | 16° F or lower | 20° F or lower | 24° F or lower | 28° F or lower | 32° F or lower |
| Spring | | | | | |
| 1 year in 10 later than | March 30 | April 10 | April 25 | May 3 | May 13 |
| 1 year in 4 later than | March 21 | April 2 | April 17 | April 26 | May 7 |
| 1 year in 2 later than | March 11 | March 25 | April 7 | April 19 | April 30 |
| 3 years in 4 later than | February 28 | March 16 | March 28 | April 12 | April 24 |
| 9 years in 10 later than | February 19 | March 8 | March 19 | April 5 | April 18 |
| Fall | | | | | |
| 1 year in 10 earlier than | November 8 | October 31 | October 21 | October 6 | September 25 |
| 1 year in 4 earlier than | November 18 | November 7 | October 28 | October 16 | October 2 |
| 1 year in 2 earlier than | November 28 | November 15 | November 4 | October 26 | October 9 |
| 3 years in 4 earlier than | December 9 | November 22 | November 12 | November 5 | October 17 |
| 9 years in 10 earlier than | December 18 | November 29 | November 19 | November 15 | October 24 |

Rivers join at Fairmont, in Marion County, to form the Monongahela River.

## Farming

According to the 1969 Census of Agriculture, about 43 percent of Harrison County is in farms A total of 17,328 acres is cropped, 34,942 acres is pastured, 24,197 acres is wooded, and 37,692 is otherwise farmed. About 41 percent of Taylor County is in farms. A total of 7,344 acres is cropped, 10,892 acres is pastured, 12,110 acres is wooded, and 15,391 acres is otherwise farmed. Harrison County had 712 farms, which averaged about 160 acres in size. Taylor County had 305 farms, which averaged about 150 acres in size.

In recent years, both the total acreage in farms and the total number of farms have decreased and the size of farms has increased. Many farms that do not have easy access to good roads are being abandoned and are reverting to woodland. Also, many steep to very steep areas that were once used for crops or pasture are reverting to woodland.

Livestock farms predominate. Beef cattle, the major farm enterprise, has been important to the economy for many years. Among the contributing factors are the large extent of lime-influenced soils, the hilly topography, the 40 inches of fairly evenly distributed rainfall, and the favorable growing season. Somewhat less income has been derived from dairy products, poultry and poultry products, feed seeds, hay, forage, and silage.

About 37 percent of all farms in Harrison County and 46 percent of all farms in Taylor County are part time.

## Transportation and Industry

Harrison and Taylor Counties have a good network of Federal, State, and county roads. U. S. Highway 50 crosses the center of the two-county area in an east-west direction. Part of this highway west of Clarksburg now has four lanes. U. S. Highway 19 crosses Harrison County in a north-south direction near the center of the county. Also serving Harrison County are State Routes 20, 76, 73, and 23. U. S. Highways 119 and 250 cross Taylor County in a general north-south direction Also serving Taylor County are State Routes 76 and 73. Interstate 79 runs in a north-south direction across eastern Harrison County.

The Chessie System Railroad serves both Harrison and Taylor Counties. Grafton is an important railroad center. The Benedum Airport, at Bridgeport in Harrison County, serves the area with air transportation.

The manufacturing industry employs the largest number of people in the two-county area. Glass, machine tools, indoor-outdoor carpet, plastic products, mine machinery, air compressors, electroplating electrodes, and garments are among the items manufactured. Clarksburg is a center for the manufacture of various kinds of glass products. A major industry in Grafton is the manufacture of indoor-outdoor carpet.

## Water Supply

The Harrison and Taylor County area is well supplied with surface streams The West Fork River in Harrison County and the Tygart Valley River in Taylor County are large enough for some industrial uses. Limestone areas have a few moderately flowing springs. Municipal water systems serve the cities.

Most rural residents depend on shallow and deep wells. Some of these wells produce hard water, mainly as a result of the content of bases, commonly calcium carbonate. Because the streams and small water impoundments are numerous, water supply for livestock is plentiful.

## *References*

(1) Allan, Philip, F., Garland, Lloyd E , and Dugan, R. Franklin. 1963. Rating northeastern soils for their suitability for wildlife habitat Trans. of the 28th N. Am. Widl. and Nat. Resour. Conf., pp 247–261, illus

(2) American Association of State Highway [and Transportation] Officials. 1961. Standard specifications for highway materials and methods of sampling and testing Ed. 8, 2 vol., illus

(3) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487–69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus

(4) Davis, Dorothy. 1970. History of Harrison County, West Virginia. 986 pp , illus.

(5) Ferguson, Roland H. 1964 The timber resources of West Virginia. Northeast. Forest Exp Stn., Forest Serv., U.S. Dep. Agric. Resour. Bull. NE-2, 123 pp., illus
(6) McCarthy, E. F. 1933 Yellow poplar characteristics, growth, and management U S Dep. Agric Tech Bull 356, 58 pp., illus
(7) Portland Cement Association 1962. PCA soil primer 52 pp., illus
(8) Schnur, G. Luther. 1937 Yield, stand, and volume tables for even-aged upland oak forests. U.S. Dep Agric. Tech. Bull. 560, 88 pp., illus.
(9) United States Department of Agriculture. 1951 Soil survey manual U S. Dep Agric Handb. 18, 503 pp., illus.
(10) ————————1960 Soil classification, a comprehensive system, 7th approximation 265 pp , illus. [Supplements issued in March 1967 and in September 1968]
(11) ————————1961. Yield of Virginia pine. Southeast. Forest Exp Stn , Forest Serv., U.S. Dep. Agric. Pap No. 124, 11 pp., illus.
(12) ————————1970 West Virginia soil and water conservation needs inventory 189 pp., illus

## Glossary

**Aeration, soil.** The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere, but that in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

**Aggregate, soil.** Many fine particles held in a single mass or cluster Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

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

**Aspect** (forestry). The direction toward which a slope faces. Synonym: Exposure.

**Association, soil.** A group of soils geographically associated in a characteristic repeating pattern

**Available water capacity** (also termed available moisture capacity) The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil

**Base saturation.** The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.

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

**Bench terrace.** A shelflike embankment of earth that has a level or nearly level top and a steep or nearly vertical downhill face, constructed along the contour of sloping land or across the slope to control runoff and erosion The downhill face of the bench may be made of rocks or masonry, or it may be planted to vegetation

**Calcareous soil.** A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid

**Channery soil.** A soil that contains thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches in length along the longer axis A single piece is called a fragment.

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

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

**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

**Colluvium.** Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes

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

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

*Loose.*—Noncoherent when dry or moist; does not hold together in a mass.

*Friable* —When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

*Firm.*—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

*Plastic* —When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

*Sticky* —When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material

*Hard* —When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger

*Soft.*—When dry, breaks into powder or individual grains under very slight pressure.

*Cemented* —Hard and brittle; little affected by moistening.

**Contour farming.** Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grade.

**Contour stripcropping.** Growing crops in strips that follow the contour or are parallel to terraces or diversions Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

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

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

**Eluviation.** The movement of material from one place to another within the soil, in either true solution or colloidal suspension. Soil horizons that have lost material through eluviation are said to be eluvial; those that have received material are illuvial.

**Erosion.** The wearing away of the land surface by wind (sand-blast), running water, and other geological agents

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

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

**Gleization.** The reduction, translocation, and segregation of soil compounds, notably of iron, usually in the lower horizons, as a result of waterlogging with poor aeration and drainage; expressed in the soil by mottled colors dominated by gray The soil-forming processes leading to the development of a gley soil

**Gravelly soil material.** From 15 to 50 percent of material, by volume, consists of rounded or angular rock fragments that are not prominently flattened and are up to 3 inches in diameter.

**Gully.** A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains The distinction between gully and rill is one of depth A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage V-shaped gullies result if the material is more difficult to erode with depth; whereas U-shaped gullies result if the lower material is more easily eroded than that above it

**Horizon, soil.** A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons·

*O horizon* —The layer of organic matter on the surface of a mineral soil This layer consists of decaying plant residues.

*A horizon.*—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

*B horizon* —The mineral horizon below an A horizon The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

*C horizon.*—The weathered rock material immediately beneath the

solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C

*R layer.*—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

**Illuviation.** The accumulation of material in a soil horizon through the deposition of suspended material and organic matter removed from horizons above Since part of the fine clay in the B horizon (or subsoil) of many soils has moved into the B horizon from the A horizon above, the B horizon is called an illuvial horizon

**Leached layer.** A layer from which the soluble materials have been dissolved and washed away by percolating water.

**Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state In engineering, a high liquid limit indicates that the soil has a high content of clay and a low capacity for supporting loads.

**Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and their thickness and arrangement in the soil profile.

**Mottling, soil.** Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*, size—*fine*, *medium*, and *coarse*, and contrast—*faint*, *distinct*, and *prominent* The size measurements are these: *fine*, less than 5 millimeters (about 0 2 inch) in diameter along the greatest dimension; *medium*, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0 6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

**Munsell notation.** A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4

**Natural soil drainage.** Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets Seven different classes of natural soil drainage are recognized.

*Excessively drained* soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

*Somewhat excessively drained* soils are also very permeable and are free from mottling throughout their profile.

*Well-drained* soils are nearly free from mottling and are commonly of intermediate texture.

*Moderately well drained* soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

*Somewhat poorly drained* soils are wet for significant periods but not all the time, and in Podzolic soils commonly have mottling below 6 to 16 inches, in the lower A horizon and in the B and C horizons.

*Poorly drained* soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

*Very poorly drained* soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

**Nutrient, plant.** Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil and carbon, hydrogen, and oxygen obtained largely from the air and water, are plant nutrients.

**Organic matter.** A general term for plant and animal material, in or on the soil, in all stages of decomposition. Readily decomposed organic matter is often distinguished from the more stable forms that are past the stage of rapid decomposition

**Parent material.** Disintegrated and partly weathered rock from which soil has formed.

**Ped.** An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod

**Permeability.** The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*

**pH value.** A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

**Plasticity index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

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

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

| | pH | | pH |
|---|---|---|---|
| Extremely acid | Below 4 5 | Neutral | 6.6 to 7 3 |
| Very strongly acid | 4.5 to 5.0 | Mildly alkaline | 7 4 to 7 8 |
| Strongly acid | 5 1 to 5 5 | Moderately alkaline | 7.9 to 8.4 |
| Medium acid | 5 6 to 6 0 | Strongly alkaline | 8.5 to 9.0 |
| Slightly acid | 6.1 to 6 5 | Very strongly alkaline | 9.1 and higher |

**Relief.** The elevations or inequalities of a land surface, considered collectively.

**Residuum.** 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

**Rotation grazing.** Grazing two or more pastures, or parts of a range, in regular order, with definite recovery periods between grazing periods. Contrasts with continuous grazing

**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 a soil that range in diameter from 0.05 to 2.0 millimeters Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay

**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. They are many intermediate types Some wind-deposited sands have been consolidated into sandstone.

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

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

**Shrink-swell potential** (engineering). Amount that a soil will expand when wet or contract when dry Indicates kinds of clay in soil.

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeters) to the lower limit of very fine sand (0.05 millimeters) As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

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

**Solum.** The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the soil material in these horizons are unlike those of the underlying material The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

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

**Subsoil.** Technically, the B horizon; roughly, the part of the solum below plow depth.

**Substratum.** Technically the part of the soil below the solum

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

**Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm Terraces in fields are generally built so they can be farmed Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

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

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

**Topsoil.** A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

**Upland** (geology). 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 upper limit 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.

**Wilting point** (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which plants (specifically sunflower) wilt so much that they do not recover when placed in a dark, humid atmosphere

## GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Crop management is suggested in the mapping unit. Other information is given in tables as follows.

Acreage and extent, table 1, page 8.
Estimated yields, table 2, page 34.
Woodland, tables 3 and 4, pages 36 and 45.
Wildlife habitat, table 5, page 48.
Engineering uses of soils, tables 6, 7, and 8, pages 50, 56, and 62.
Town and country planning, table 9, page 64.

| Map symbol | Mapping unit | Page | Capability unit | Woodland subclass[1/] |
|---|---|---|---|---|
| | | | Symbol | Symbol |
| AgC | Allegheny silt loam, 8 to 15 percent slopes | 9 | IIIe-4 | 2o |
| AgD | Allegheny silt loam, 15 to 25 percent slopes | 9 | IVe-3 | 2r |
| At | Atkins silt loam | 10 | IIIw-1 | 1w |
| Ch | Chavies fine sandy loam | 11 | I-6 | 2o |
| ClB | Clarksburg silt loam, 3 to 8 percent slopes | 11 | IIe-14 | 2w |
| ClC | Clarksburg silt loam, 8 to 15 percent slopes | 11 | IIIe-14 | 2w |
| ClD | Clarksburg silt loam, 15 to 25 percent slopes | 12 | IVe-9 | 2w |
| ClD3 | Clarksburg silt loam, 15 to 25 percent slopes, severely eroded | 12 | VIe-1 | 2w |
| CoB | Cookport silt loam, 3 to 8 percent slopes | 12 | IIe-13 | 2w |
| CoC | Cookport silt loam, 8 to 15 percent slopes | 13 | IIIe-13 | 2w |
| CuC | Culleoka silt loam, 8 to 15 percent slopes | 13 | IIIe-11 | 2o |
| CuD | Culleoka silt loam, 15 to 25 percent slopes | 13 | IVe-11 | 2r, 3r |
| CuE | Culleoka silt loam, 25 to 35 percent slopes | 14 | VIe-1 | 2r, 3r |
| CuE3 | Culleoka silt loam, 25 to 35 percent slopes, severely eroded | 14 | VIIe-1 | 2r, 3r |
| CuF3 | Culleoka silt loam, 35 to 60 percent slopes, severely eroded | 14 | VIIe-1 | 2r, 3r |
| DeC | Dekalb sandy loam, 8 to 15 percent slopes | 14 | IIIe-12 | 4f |
| DSF | Dekalb extremely stony sandy loam, very steep | 14 | VIIs-4 | 3x, 4x |
| EnB | Ernest silt loam, 3 to 8 percent slopes | 15 | IIe-13 | 2w |
| EnC | Ernest silt loam, 8 to 15 percent slopes | 15 | IIIe-13 | 2w |
| EnD | Ernest silt loam, 15 to 25 percent slopes | 15 | IVe-9 | 2w |
| EsC | Ernest very stony silt loam, 3 to 15 percent slopes | 16 | VIs-2 | 2w |
| EsD | Ernest very stony silt loam, 15 to 35 percent slopes | 16 | VIs-2 | 2w |
| FaC | Faywood silty clay loam, 8 to 15 percent slopes | 16 | IVe-30 | 3c |
| FaD | Faywood silty clay loam, 15 to 25 percent slopes | 16 | VIe-1 | 3c |
| FaE | Faywood silty clay loam, 25 to 35 percent slopes | 17 | VIIe-1 | 3c |
| FaF | Faywood silty clay loam, 35 to 60 percent slopes | 17 | VIIe-1 | 3c |
| FO | Fluvaquents, overwash | 17 | VIIIw-1 | ------ |
| GlB | Gilpin silt loam, 3 to 8 percent slopes | 17 | IIe-10 | 2o |
| GlC | Gilpin silt loam, 8 to 15 percent slopes | 18 | IIIe-10 | 2o |
| GlD | Gilpin silt loam, 15 to 25 percent slopes | 18 | IVe-3 | 2r, 3r |
| GlE | Gilpin silt loam, 25 to 35 percent slopes | 18 | VIe-2 | 2r, 3r |
| GlF | Gilpin silt loam, 35 to 60 percent slopes | 18 | VIIe-2 | 2r, 3r |
| GsC | Gilpin very stony silt loam, 3 to 15 percent slopes | 18 | VIIs-2 | 2o |
| GsE | Gilpin very stony silt loam, 15 to 35 percent slopes | 18 | VIIs-2 | 2r, 3r |
| GTF | Gilpin very stony silt loam, very steep | 18 | VIIs-2 | 2r, 3r |
| GuC | Gilpin-Upshur complex, 8 to 15 percent slopes | 18 | IIIe-15 | 3c |
| GuC3 | Gilpin-Upshur complex, 8 to 15 percent slopes, severely eroded | 19 | IVe-15 | 3c |
| GuD | Gilpin-Upshur complex, 15 to 25 percent slopes | 19 | IVe-15 | 2c, 3c |
| GuD3 | Gilpin-Upshur complex, 15 to 25 percent slopes, severely eroded | 19 | VIe-3 | 2c, 3c |
| GuE | Gilpin-Upshur complex, 25 to 35 percent slopes | 19 | VIe-3 | 2c, 3c |
| GuE3 | Gilpin-Upshur complex, 25 to 35 percent slopes, severely eroded | 19 | VIIe-1 | 2c, 3c |
| GuF3 | Gilpin-Upshur complex, 35 to 70 percent slopes, severely eroded | 19 | VIIe-1 | 2c, 3c |
| GyB | Guernsey silt loam, 3 to 8 percent slopes | 20 | IIe-14 | 2w |
| GyC | Guernsey silt loam, 8 to 15 percent slopes | 20 | IIIe-14 | 2w |
| GyD | Guernsey silt loam, 15 to 25 percent slopes | 20 | IVe-9 | 2w |
| GyD3 | Guernsey silt loam, 15 to 25 percent slopes, severely eroded | 21 | VIe-1 | 2w |
| Ha | Hackers silt loam | 21 | I-6 | 1o |
| Ln | Lindside silt loam | 22 | IIw-7 | 1w |
| Me | Melvin silt loam | 22 | IIIw-1 | 1w |
| MoB | Monongahela silt loam, 3 to 8 percent slopes | 23 | IIe-13 | 3w |
| MoC | Monongahela silt loam, 8 to 15 percent slopes | 23 | IIIe-13 | 3w |

GUIDE TO MAPPING UNITS--Continued

| Map symbol | Mapping unit | Page | Capability unit | Woodland subclass[1/] |
|---|---|---|---|---|
| | | | Symbol | Symbol |
| No | Nolin silt loam | 24 | IIw-6 | 1o |
| Ph | Philo silt loam | 24 | IIw-7 | 1w |
| Po | Pope silt loam | 25 | IIw-6 | 2o |
| RaB | Rayne silt loam, 3 to 8 percent slopes | 25 | IIe-4 | 2o |
| RaC | Rayne silt loam, 8 to 15 percent slopes | 25 | IIIe-4 | 2o |
| Sm | Strip mines | 25 | ------- | ------ |
| Tg | Tygart silt loam | 26 | IIIw-5 | 2w |
| UF | Udifluvents and Fluvaquents | 26 | Vw-1 | 2w |
| UhC3 | Upshur silty clay, 8 to 15 percent slopes, severely eroded | 27 | IVe-30 | 3c |
| UhD3 | Upshur silty clay, 15 to 25 percent slopes, severely eroded | 27 | VIe-1 | 3c, 4c |
| UL | Urban land | 27 | ------- | ------ |
| VaB | Vandalia silty clay loam, 3 to 8 percent slopes | 28 | IIe-15 | 3c |
| VaC | Vandalia silty clay loam, 8 to 15 percent slopes | 28 | IIIe-15 | 3c |
| VaD3 | Vandalia silty clay loam, 15 to 25 percent slopes, severely eroded | 28 | VIe-3 | 3c |
| WmC | Westmoreland silt loam, 8 to 15 percent slopes | 29 | IIIe-11 | 2o |
| WmC3 | Westmoreland silt loam, 8 to 15 percent slopes, severely eroded | 29 | IVe-11 | 2o |
| WmD | Westmoreland silt loam, 15 to 25 percent slopes | 29 | IVe-11 | 2r, 3r |
| WmD3 | Westmoreland silt loam, 15 to 25 percent slopes, severely eroded | 29 | VIe-1 | 2r, 3r |
| WmE | Westmoreland silt loam, 25 to 35 percent slopes | 29 | VIe-1 | 2r, 3r |
| WmE3 | Westmoreland silt loam, 25 to 35 percent slopes, severely eroded | 29 | VIIe-1 | 2r, 3r |
| WmF | Westmoreland silt loam, 35 to 60 percent slopes | 30 | VIIe-1 | 2r, 3r |
| WrC | Wharton silt loam, 8 to 15 percent slopes | 30 | IIIe-13 | 2w |
| WrD | Wharton silt loam, 15 to 25 percent slopes | 30 | IVe-9 | 2w |
| ZoB | Zoar silt loam, 3 to 8 percent slopes | 31 | IIe-13 | 3w |
| ZoC | Zoar silt loam, 8 to 15 percent slopes | 31 | IIIe-13 | 3w |

1/ The first of two woodland subclass symbols indicates north aspect; the second, south aspect.

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