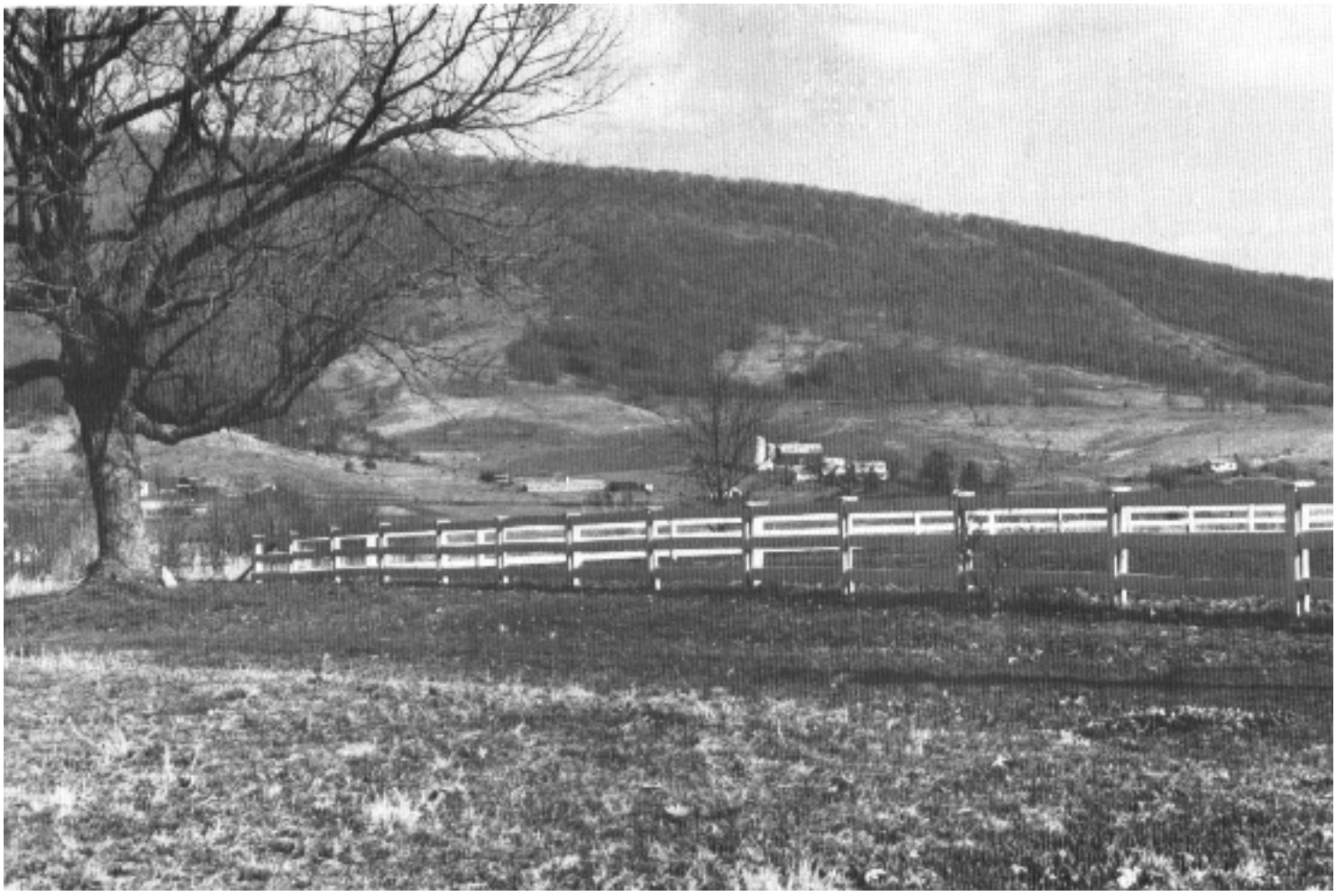
United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
the Forest Service
and the West Virginia University
Agricultural
and Forestry Experiment Station

Soil Survey of Grant and Hardy Counties West Virginia



How To Use This Soil Survey

General Soil Map

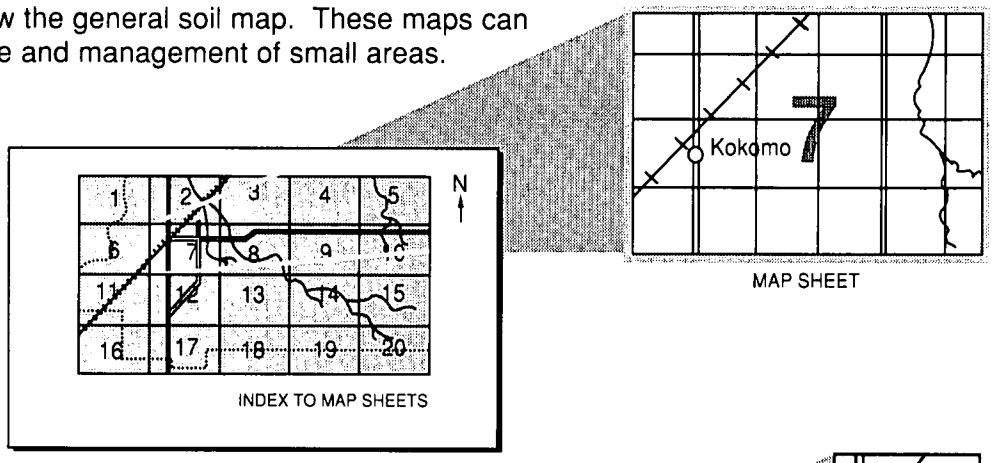
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

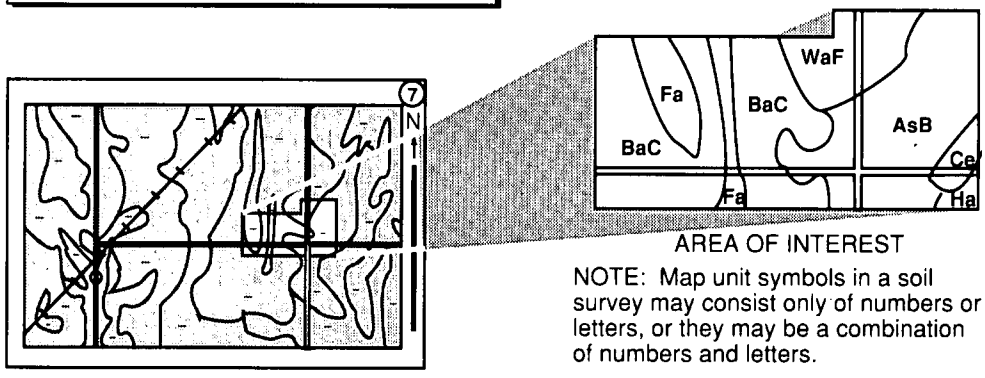
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

MAP SHEET

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET

AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. 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, regardless of race, color, national origin, sex, religion, marital status, handicap, or age.

Major fieldwork for this soil survey was completed in 1979. Soil names and descriptions were approved in 1980. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1980. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, and the West Virginia University Agricultural and Forestry Experiment Station. The survey is part of the technical assistance furnished to the Potomac Valley Soil Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Rolling Berks and Weikert soils are in the foreground. Dekalb, Hazleton, Laidig, and Opequon soils are on the mountainous uplands and foot slopes.

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Issued November 1989

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Foreword

This soil survey contains information that can be used in land-planning programs in Grant and Hardy Counties. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Rollin N. Swank
State Conservationist
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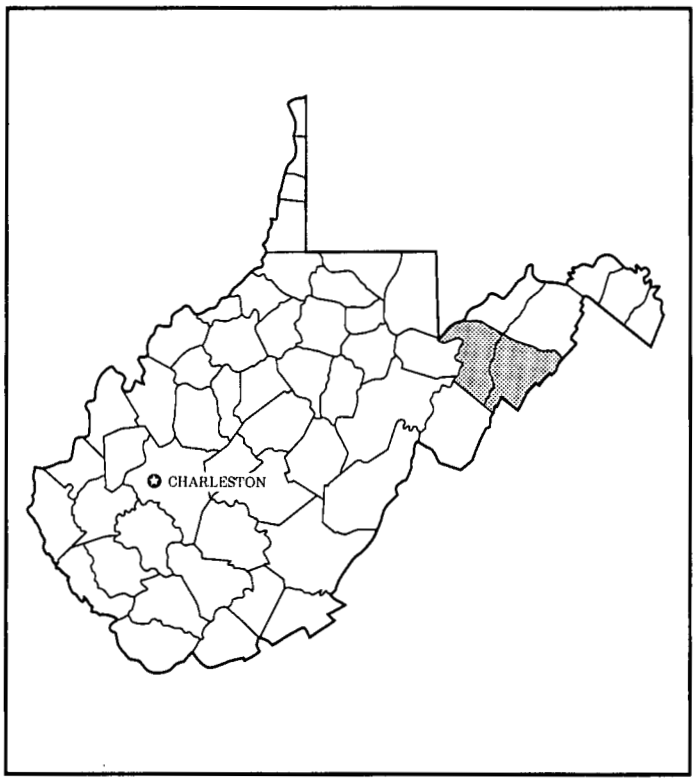

Location of Grant and Hardy Counties in West Virginia.

Soil Survey of Grant and Hardy Counties, West Virginia

By Ron Estepp, Soil Conservation Service

Fieldwork by Robert J. Baumley, Robert A. Becker, Ron Estepp, Edward A. Kesecker, Joseph P. Ross, Kelley N. Sponaugle, Dale G. Sprankle, David G. Van Houten, Linton Wright Jr., and Troy D. Yoakum, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
In cooperation with
the Forest Service
and the West Virginia University Agricultural and Forestry Experiment Station

GRANT and HARDY COUNTIES are in the northeast part of West Virginia. The total area of the two counties is 680,320 acres, or about 1,063 square miles.

General Nature of the Survey Area

This section describes the farming trends and climate of Grant and Hardy Counties.

Farming

The 1974 Census of Agriculture (*8*) reports a total of 872 farms in Grant and Hardy Counties and a total farm acreage of 298,672.

The main types of farming in the survey area are raising poultry, beef cattle, sheep, and hogs and producing corn, pasture, and hay and some wheat, oats, and barley. A few dairies and a few orchards are in the survey area. Poultry provides the greatest source of farm income followed by livestock, livestock products, crops, and hay.

The census shows that Hardy County is the leading county in the State in market value of agricultural products sold. Hardy County is also the leading county in the State in value of poultry and poultry products sold, and Grant County ranks third.

Climate

Winters are cold and snowy at high elevations in Grant and Hardy Counties. The valleys also are frequently cold, but intermittent thaws preclude a long-lasting snow cover. Summers are fairly warm on mountain slopes and very warm in the valleys.

Rainfall usually is evenly distributed during the year, but it is appreciably heavier on the windward, west-facing slopes than in the valleys. Normal annual precipitation is adequate for all crops, although sometimes the summer temperature and the growing-season length, particularly at higher elevations, are inadequate and periodic summer droughts occasionally cause inadequate moisture for crops (fig. 1). Such droughts have occurred during 1963-66 and 1976-77.

The divide of the Allegheny Mountains, the main topographic barrier of the Appalachian Plateaus, runs through western Grant County and forms a "rainshadow" that shelters most of the survey area from the prevailing storm systems that move from west to east. For this reason, climatic data from western Grant County (Bayard data) show lower average temperatures and higher average precipitation than the data from central and eastern Grant County or Hardy County (Wardensville data) show.

Table 1 gives data on temperature and pecipitation for the survey area, as recorded at Wardensville and

Figure 1.—Droughtiness in an area of Berks and Weikert soils creates a habitat for prickly-pear cactus.

Bayard, West Virginia, for the period 1951 to 1973. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In the Wardensville area, the average temperature in winter is 32 degrees F and the average daily minimum temperature is 20 degrees. The lowest temperature on record, which occurred at Wardensville on January 2, 1968, is -16 degrees. In summer the average temperature is 71 degrees and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on September 1, 1953, is 103 degrees.

In the Bayard area, in winter the average temperature is 28 degrees, and the average daily minimum temperature is 18 degrees. The lowest temperature on record, which occurred at Bayard on January 2, 1968, is -27 degrees. In summer the average temperature is 65 degrees and the average daily maximum temperature is 78 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 94 degrees.

Growing degree days, shown in table 1, are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

In the Wardensville area, 20 inches, or 60 percent of the total annual precipitation, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 16 inches. The heaviest 1-day rainfall at Wardensville during the period of record was 5.37 inches on October 16, 1954.

In the Bayard area, 25 inches, or 50 percent of the total annual precipitation, normally falls in April through September. In 2 years out of 10, the rainfall in April through September is less than 22 inches. The heaviest 1-day rainfall at Bayard during the period of record was 4.25 inches on October 15, 1954.

In the Wardensville area, the average seasonal snowfall is 29 inches. The greatest snow depth at any one time during the period of record was 36 inches. On the average, 12 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

In the Bayard area, average seasonal snowfall is 96 inches. The greatest snow depth at any one time during the period of record was 33 inches. On the average, 40 days have at least 1 inch of snow on the ground.

The average relative humidity in midafternoon in the survey area is 60 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The percentage of possible sunshine is 60 in summer and 30 in winter. The prevailing wind is from the northwest. Average windspeed is highest, 8 miles per hour, in winter.

Heavy rains, which occur at any time of the year, and severe thunderstorms in summer sometimes cause flash flooding, particularly in narrow valleys. Thunderstorms occur on about 40 days each year, and most occur in summer.

Climatic data for this section were provided for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material has few or no roots or other living organisms and has been changed very little by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will

always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

A survey of Grant County was published in 1922 as part of the soil survey of Grant and Mineral Counties, and a survey of Hardy County was published in 1930 in the soil survey of Hardy and Pendleton Counties. This survey contains additional and updated information and has maps that show the soils in greater detail.

A flood in November 1985 made significant changes in many of the soils on flood plains in the survey area. Among the major changes were:

1. Widening of stream channels and extensive streambank erosion.
2. Formation of new stream channels in soils previously used as cropland.
3. Scouring in some areas of several inches to several feet of soil.
4. Widespread deposition of cobbles, sand, and silt.

Much of the flood-deposited soil and rock fragments were used to fill the new stream channels and scoured areas. The soils that were drastically disturbed were identified and mapped for this survey. Many areas that underwent lesser changes have not been shown because the maps were nearly complete at the time the flooding took place.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

In some areas on the borders of the general soil map of Grant and Hardy Counties, the names of the map units do not match those on the general soil maps of adjacent counties. These differences are the result of changes in the detail of mapping or the method of soil classification or because there are different proportions of the same soils in the units in the adjoining counties.

Soil Descriptions

1. Dekalb-Hazleton-Laidig-Opequon

Gently sloping to very steep, well drained, deep to shallow soils on uplands

This map unit consists of rugged mountainous regions and colluvial foot slopes. It is on most of the large mountains in the survey area. Stones cover the surface in most areas.

This unit makes up about 27 percent of the survey area. The unit is about 16 percent Dekalb soils, 16 percent Hazleton soils, 16 percent Laidig soils, 16 percent Opequon soils, and 36 percent minor soils.

The Dekalb soils are moderately deep and are throughout the uplands. They formed in material weathered mostly from sandstone. They have a black, dark grayish brown, and yellowish brown, medium-textured, channery surface layer and a yellowish brown, medium-textured, channery or very channery subsoil.

The Hazleton soils are deep and are on uplands. They formed in material weathered mostly from sandstone. They have a black and brown, channery, moderately coarse textured surface layer and a yellowish brown, channery or very channery, medium-textured and moderately coarse textured subsoil.

The Laidig soils are deep and are on foot slopes on uplands. They formed in material weathered from acid sandstone, shale, and siltstone. They have a very dark gray and dark grayish brown, channery, medium-textured and moderately coarse textured surface layer and a yellowish brown, channery, medium-textured and moderately coarse textured subsoil that is firm and brittle in the lower part.

The Opequon soils are shallow and are on uplands. They formed in material weathered mostly from limestone, and they have common limestone outcrops. The Opequon soils have a dark brown and reddish brown, medium-textured surface layer and a red, fine-textured subsoil.

The minor soils in this unit are moderately well drained Buchanan soils and well drained Murrill soils on foot slopes, in coves, and along drainageways. Well drained Edom soils are in some limestone areas. Well drained Elliber and Lehew soils are on ridgetops, benches, and hillsides.

This unit is about 80 percent wooded. Many areas of the Opequon soils have been cleared. A few areas of the Elliber soils have been cleared and used for orchards.

Steep slopes, stones on the surface, and shallowness to bedrock limit the use of the soils in this unit. A few limestone quarries are in the unit. A few chert quarries are used as a source of roadfill.

This map unit is poorly suited as a site for sanitary facilities and buildings. Steep slopes and limited depth to bedrock are the main limitations. Pollution of ground water by waste disposal facilities is a hazard in areas with limestone bedrock.

2. Berks-Weikert

Gently sloping to very steep, well drained, moderately deep and shallow soils on uplands

This map unit consists of sloping hills at lower elevations and some rugged mountainous regions. It is commonly gently sloping and strongly sloping along the Lunice Creek and Patterson Creek watersheds in Grant County and near the communities of Rig and Flats in

Hardy County. It is steeper along higher elevations in the more mountainous regions.

This map unit makes up about 30 percent of the survey area. It is about 50 percent Berks soils, 25 percent Weikert soils, and 25 percent minor soils.

The Berks soils are moderately deep. They formed in material weathered mostly from shale. They have a dark brown and grayish brown, channery surface layer and a yellowish brown, shaly or very shaly subsoil. They are medium textured.

The Weikert soils are shallow. They formed in material weathered mostly from shale. They have a very dark grayish brown and yellowish brown, shaly surface layer and a yellowish brown, very shaly subsoil. They are medium textured.

The minor soils in this map unit are moderately well drained Ernest and Clarksburg soils on foot slopes, in coves, and along small drainageways; somewhat excessively drained Potomac soils, well drained Tioga soils, and moderately well drained Basher soils on flood plains; and well drained Dekalb soils and excessively drained Rushtown soils on uplands.

This map unit is about 65 percent wooded. Some cleared areas have been used for pasture and hay. Some areas in this map unit are used for residential development.

Limited depth to bedrock, droughtiness, and steep slopes limit the uses of this map unit.

This map unit is limited as a site for sanitary facilities but otherwise provides adequate homesites on areas which are not excessively steep. The bedrock is generallly rippable if deep excavations are required. Water from wells usually has a high concentration of dissolved minerals, including iron and sulfur.

3. Potomac-Tioga-Melvin

Nearly level, somewhat excessively drained, well drained, and poorly drained, deep soils on flood plains

This map unit consists of soils on flood plains along the major streams of the survey area. The soils formed in material washed from acid and lime-influenced soils on uplands. The well drained soils are mainly parallel and adjacent to the streams. The wetter soils are generally farther from the streams.

This map unit makes up about 5 percent of the survey area. The unit is about 50 percent Potomac soils, 14 percent Tioga soils, 9 percent Melvin soils, and 27 percent minor soils.

The Potomac soils are somewhat excessively drained. They have a dark yellowish brown and dark brown, moderately coarse textured surface layer and a dark yellowish brown, very cobbly and very gravelly, coarse-textured substratum.

The Tioga soils are well drained. They have a dark yellowish brown, moderately coarse textured surface layer and a brown and dark brown, medium-textured and moderately coarse textured subsoil.

The Melvin soils are poorly drained. They have a dark gray, medium-textured surface layer and a gray and light gray, mottled, medium-textured subsoil.

The minor soils in this map unit are well drained Huntington and Chagrin soils, moderately well drained Lindside and Lobdell soils, moderately well drained Basher soils, and very poorly drained or poorly drained Dunning soils. All are on flood plains. The well drained and moderately well drained minor soils are among the most productive in the survey area for the commonly grown crops.

This map unit is mostly cleared and is used intensively for row crops, hay, or pasture (fig. 2). The poorly drained soils require drainage if used continually for row crops or hay.

This map unit is limited for building site development by a hazard of flooding. The wetness of Melvin soils limits their suitability as a site for septic tank filter fields or buildings with basements.

4. Berks-Lehew-Dekalb

Gently sloping to very steep, well drained, moderately deep soils on uplands

This map unit consists of sloping hills and some rugged mountainous regions of the survey area. It is at the middle and upper elevations of South Branch Mountain in Hardy County and along the eastern slopes of Allegheny Mountain in Grant County.

This map unit makes up about 16 percent of the survey area. The unit is about 47 percent Berks soil, 30 percent Lehew soils, 14 percent Dekalb soils, and 9 percent minor soils.

The Berks soils formed in material weathered mostly from shale. They have a dark brown and grayish brown, channery surface layer and a yellowish brown, shaly or very shaly subsoil. They are medium textured.

The Lehew soils formed in material weathered mostly from sandstone. They have a black and brown, medium-textured, channery surface layer and a reddish brown and yellowish red, medium-textured, channery subsoil.

The Dekalb soils formed in material weathered mostly from sandstone. They have a black, dark grayish brown, and yellowish brown, medium-textured, channery surface layer and a yellowish brown, medium-textured, channery or very channery subsoil.

The minor soils in this map unit are well drained Calvin and Weikert soils on uplands and well drained Laidig soils and moderately well drained Buchanan and Ernest soils on foot slopes, in coves, and along small drainageways.

This map unit is about 85 percent wooded. The cleared areas are mainly Berks and Calvin soils that are used for pasture and some hay. The rest of this map unit is in mixed hardwoods.

Steep slopes, stoniness, droughtiness, and limited depth to bedrock limit the use of this map unit. This map

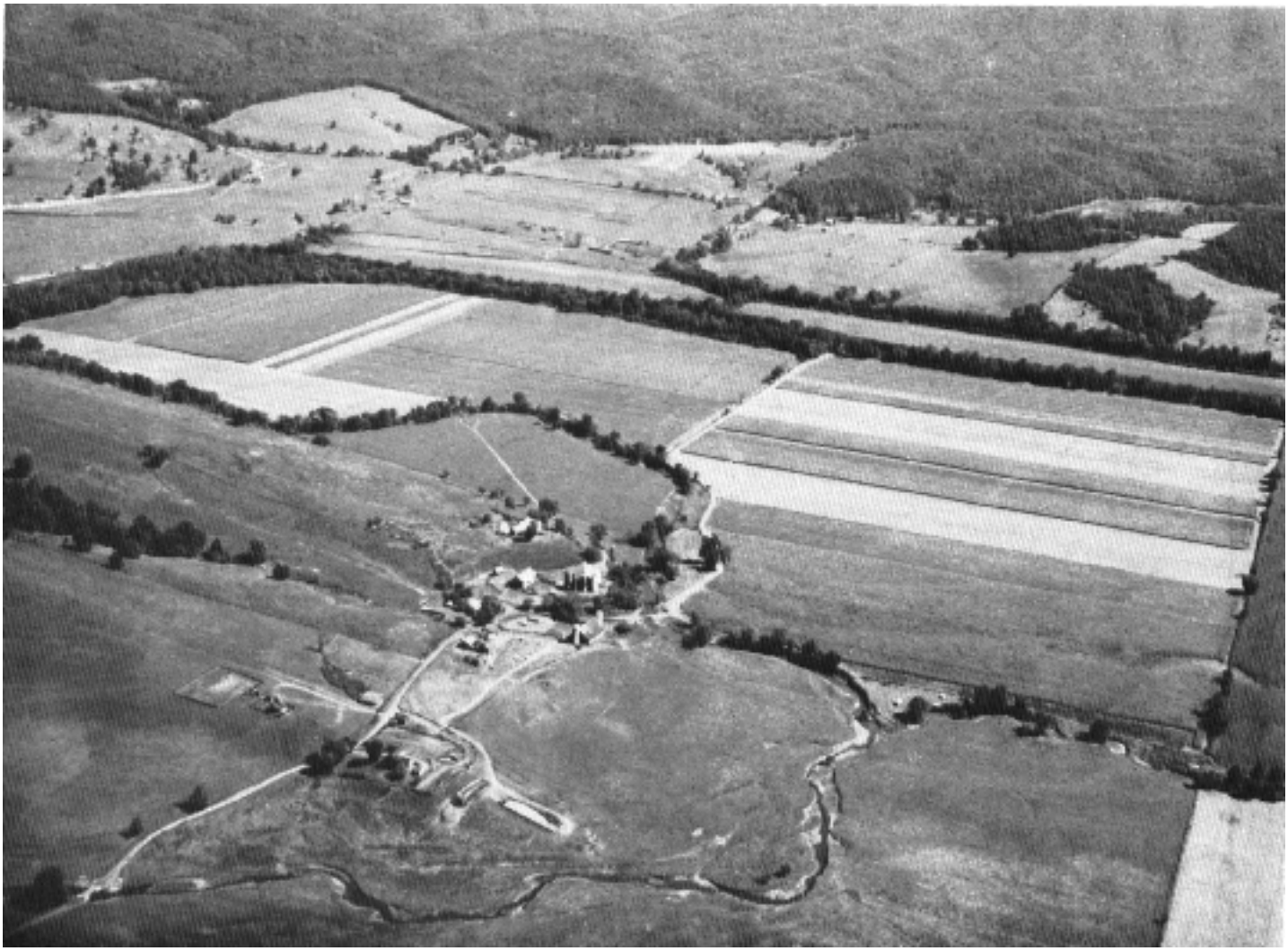

Figure 2.—The cleared areas adjacent to the streams are common in the Potomac-Tioga-Melvin unit.

unit is limited as a site for sanitary facilities and homes because of the limited depth to bedrock and the steep slopes. The bedrock under the Berks soils is generally rippable if deep excavations are required.

5. Monongahela-Clarksburg-Ernest

Nearly level to moderately steep, moderately well drained, deep soils on terraces and foot slopes

This map unit consists of soils along the major river valleys throughout the survey area but is above flooding (fig. 3).

This map unit makes up about 6 percent of the survey area. The unit is about 30 percent Monongahela soils, 26 percent Clarksburg soils, 24 percent Ernest soils, and 20 percent minor soils.

The Monongahela soils are nearly level to strongly sloping and are throughout the terraces. The soils formed in material washed from soils on uplands underlain by shale, siltstone, and sandstone. They have a brown and yellowish brown, medium-textured surface layer and a yellowish brown, medium-textured subsoil that is very firm and brittle in the lower part.

The Clarksburg soils are gently sloping to moderately steep. They are on foot slopes, in coves, and along small drainageways on the terraces. The soils formed in material that moved downslope from soils on uplands that are underlain by shale, siltstone, limestone, and sandstone. They have a very dark grayish brown, medium-textured surface layer and a yellowish brown and brownish yellow, medium-textured and moderately

Figure 3.—Typical landscape in the Monongahela-Clarksburg-Ernest unit.

fine textured subsoil that is very firm and brittle in the lower part.

The Ernest soils are gently sloping to moderately steep and are on foot slopes, in coves, and along small drainageways on the terraces. The soils formed in material that moved downslope from soils on uplands that are underlain by shale, siltstone, and sandstone. They have a dark brown, medium-textured surface layer and a yellowish brown, medium-textured and moderately fine textured subsoil that is very firm and brittle in the lower part.

The minor soils in this map unit are well drained Allegheny soils on stream terraces; well drained Laidig soils and moderately well drained Buchanan soils on colluvial foot slopes, in coves, and along small drainageways; somewhat excessively drained Potomac soils and well drained Tioga and Chagrin soils on flood plains; moderately well drained Lindside and Lobdell soils on flood plains; and moderately well drained Basher soils and poorly drained Melvin soils on flood plains. Well drained Berks and Weikert soils and outcrops of shale bedrock are on steep slopes and along escarpments.

This map unit is mostly cleared. It is used for general farming and for homesites and community development.

A seasonal high water table and slow permeability limit the soils as a site for sanitary facilities and homes with basements. Large filter fields are required for septic systems. Water from wells in this map unit often has a high concentration of dissolved minerals, including iron and sulfur.

6. Schaffenaker-Drall

Gently sloping to very steep, well drained and excessively drained, moderately deep and deep soils on uplands

This map unit consists of rugged, mountainous regions mainly in the Wardensville area and in the mountains east of the Lost River in Hardy County and in a few areas on New Creek Mountain in Grant County. This map unit is stony in most areas.

This map unit makes up about 2 percent of the survey area. The unit is about 28 percent Schaffenaker soils, 24 percent Drall soils, and 48 percent minor soils.

The Schaffenaker soils are moderately deep, well drained, and coarse textured. They formed in material weathered from sandstone. They have a very dark gray and pale brown surface layer and a brownish yellow and yellowish brown subsoil.

The Drall soils are deep, excessively drained, and coarse textured. They formed in material weathered from sandstone. They have a very dark grayish brown and dark yellowish brown, channery surface layer and a yellowish brown, channery subsoil.

The minor soils in this map unit are well drained Dekalb and Hazleton soils on uplands; well drained Laidig and Allegheny Variant soils on foot slopes, in coves, and along drainageways; and moderately well drained Buchanan soils on foot slopes, in coves, and along drainageways. Also included on uplands are areas of Rock outcrop and Rubble land.

Nearly all of this map unit is woodland, mainly mixed, low quality hardwoods. Steep slopes, stoniness, droughtiness, and depth to bedrock limit this map unit for most uses.

7. Shouns-Belmont-Calvin high base substratum

Moderately steep to very steep, well drained, moderately deep and deep soils on uplands

This map unit consists of a narrow band of foot slopes and rugged, mountainous regions in a northeast-southwest direction across Grant County. It is only on the eastern slopes of Allegheny Mountain. This map unit is stony in most areas.

This map unit makes up about 2 percent of the survey area. The unit is about 44 percent Shouns soils, 20 percent Belmont soils, 15 percent Calvin soils, and 21 percent minor soils.

The Shouns soils are deep and moderately steep. They are on foot slopes on the uplands. The soils formed in material weathered from shale, siltstone, and sandstone. They have a very dark grayish brown, medium-textured surface layer and a dark reddish brown and brown, medium-textured and moderately fine textured subsoil.

The Belmont soils are deep and moderately steep to very steep. They are throughout the uplands. The soils formed in material weathered from limestone and calcareous shale. They have a dark brown, medium-textured surface layer and a reddish brown, dark reddish brown, and dark red, medium-textured, moderately fine textured, and fine textured subsoil.

The Calvin high base substratum soils are moderately deep and moderately steep to very steep. They are throughout the uplands. The soils formed in materials weathered from calcareous shale and siltstone and some interbedded limestone. They have a very dark grayish brown, medium-textured surface layer and a dark reddish brown, medium-textured, channery subsoil.

The minor soils in this map unit are well drained Dekalb soils on uplands and well drained Laidig soils and moderately well drained Buchanan soils on foot slopes, in coves, and along drainageways.

This map unit is mostly wooded. Some areas have been cleared of trees and stones and are used for pasture. The Belmont and Shouns soils are suitable for grass and trees.

Slope and stones on the surface limit the soils for most uses.

8. Wharton-Gilpin-Cavode

Gently sloping to very steep, well drained to somewhat poorly drained, moderately deep and deep soils on uplands

This map unit consists of soils on the Appalachian Plateaus in the western part of Grant County. It mainly is gently sloping and strongly sloping, but it is very steep where the plateau is dissected by streams. This map unit is stony in most places.

This map unit makes up about 12 percent of the survey area. It is about 20 percent Wharton soils, 20 percent Gilpin soils, 12 percent Cavode soils, and 48 percent minor soils.

The Wharton soils are deep, moderately well drained, and gently sloping and strongly sloping. They formed in material weathered mostly from shale and sandstone. They have a very dark gray and dark brown, medium-textured surface layer and a yellowish brown and strong brown, medium-textured and moderately fine textured subsoil.

The Gilpin soils are moderately deep, well drained, and gently sloping to very steep. They formed in material weathered from siltstone, shale, and sandstone. They have a black and yellowish brown, channery, medium-textured surface layer and a strong brown, channery, medium-textured subsoil.

The Cavode soils are deep, somewhat poorly drained, and gently sloping. They formed in material weathered from shale and some siltstone and sandstone. They have a very dark gray and brown, medium-textured surface layer and a yellowish brown and light brownish gray, fine-textured and moderately fine textured subsoil.

The minor soils in this map unit are well drained Clymer and Dekalb soils on uplands; well drained or

excessively drained Leetonia soils on uplands; moderately well drained Buchanan soils on foot slopes, in coves, and along drainageways; poorly drained or somewhat poorly drained Buchanan Variant soils on foot slopes, in coves, and along drainageways; and Rock outcrop and Rubble land on uplands.

This map unit is mostly wooded, but some large areas have been cleared and used for hay, pasture, and row crops. Some large areas are being strip-mined for coal.

Wetness and stones on the surface limit the uses of this map unit.

Most of this map unit is limited as a site for sanitary facilities and building site development. Wetness and stones on the surface and the limited depth to bedrock of the Gilpin soils are the main limitations. The Gilpin soils with slopes of less than 15 percent are suitable as sites for homes without basements.

Detailed Soil Map Units

Dr. John C. Sencindiver, assistant professor of soil science, West Virginia University Agricultural Experiment Station, assisted with the preparation of this section and the section "Soil Series and Their Morphology."

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Berks channery silt loam, 25 to 35 percent slopes, is one of several phases in the Berks series.

Some map units are made up of two or more major soils. These map units are called soil complexes or undifferentiated groups.

A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Berks-Weikert shaly silt loams, 8 to 15 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in the mapped areas are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Lehew and Dekalb channery loams, 8 to 15 percent slopes, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop and Rubble land are examples. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

AgB—Allegheny loam, 3 to 8 percent slopes. This soil is gently sloping and well drained. It is on stream terraces along the major rivers of the survey area.

Typically, the surface layer is dark brown loam about 10 inches thick. The subsoil is about 37 inches thick. The upper 25 inches of the subsoil is brown clay loam and gravelly clay loam mottled with strong brown and reddish brown. The lower 12 inches is strong brown gravelly clay loam mottled with red and pinkish gray. The substratum extends to a depth of 60 inches or more. It is pale brown clay loam mottled with red and light brownish gray.

Included with this soil in mapping are a few areas of Monongahela soils, soils with a surface layer of gravelly loam, and soils that have more sand in the surface layer and subsoil than this Allegheny soil has. Also included are several areas of soils that have a red, reddish brown,

or yellowish red subsoil; a few areas along the Cacapon River and smaller drainageways that have very gravelly and very cobbly layers at a depth of more than 30 inches; and a few nearly level soils and strongly sloping soils. Included soils make up about 35 percent of this map unit.

The available water capacity of this Allegheny soil is moderate or high, and permeability is moderate. Runoff is medium, and natural fertility is low. Where unlimed, this soil is strongly acid or very strongly acid. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for cultivated crops and hay. The hazard of erosion is moderate in cultivated areas and is a management concern. If this soil is cultivated, cultivating on the contour, using hay in the crop sequence, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour helps to control erosion.

This soil has few, if any, limitations for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIe.

AgC—Allegheny loam, 8 to 15 percent slopes. This soil is strongly sloping and well drained. It is on stream terraces along the major rivers of the survey area.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is about 36 inches thick. The upper 24 inches of the subsoil is brown clay loam and gravelly clay loam mottled with strong brown and reddish brown. The lower 12 inches is strong brown gravelly clay loam mottled with red and pinkish gray. The substratum extends to a depth of 60 inches or more. It is pale brown clay loam mottled with red and light brownish gray.

Included with this soil in mapping are a few areas of Monongahela soils, soils with a surface layer of gravelly loam, and soils that have more sand in the surface layer and subsoil than this Allegheny soil has. Also included are several areas of soils that have a red, reddish brown, or yellowish red subsoil; a few areas along the Cacapon River and smaller drainageways of soils that have very gravelly and very cobbly layers at a depth of more than 30 inches; and a few areas of gently sloping soils and moderately steep soils. Included soils make up about 30 percent of this map unit.

The available water capacity of this Allegheny soil is moderate or high, and permeability is moderate. Runoff is rapid, and natural fertility is low. Where unlimed, this soil is strongly acid or very strongly acid. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for cultivated crops and hay. The hazard of erosion is severe in cultivated areas and is a management concern. If this soil is cultivated, cultivating on the contour, conservation tillage, using hay in the crop sequence, maintaining sod in shallow drainageways, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour helps to control erosion.

Slope is the major limitation of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

AgD—Allegheny loam, 15 to 25 percent slopes. This soil is moderately steep and well drained. It is on stream terraces along the major rivers of the survey area.

Typically, the surface layer is dark brown loam about 6 inches thick. The subsoil is about 32 inches thick. The upper 20 inches of the subsoil is brown clay loam and gravelly clay loam mottled with strong brown and reddish brown. The lower 12 inches is strong brown gravelly clay loam mottled with red and pinkish gray. The substratum extends to a depth of 60 inches or more. It is pale brown clay loam mottled with red and light brownish gray.

Included with this soil in mapping are a few areas of soils with a surface layer of gravelly loam and soils that have more sand in the subsoil than this Allegheny soil has. Also included are several areas of soils that have a red, reddish brown, or yellowish red subsoil; a few areas of soils that have very cobbly or very gravelly layers at a depth of more than 24 inches; a few small areas of strongly sloping soils and steep soils; and a few areas of soils with bedrock at a depth of less than 60 inches. Included soils make up about 35 percent of this map unit.

The available water capacity of this Allegheny soil is moderate or high, and permeability is moderate. Runoff is rapid, and natural fertility is low. Where unlimed, this soil is strongly acid or very strongly acid. The depth to bedrock is more than 60 inches.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture. It is used mainly for pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the

contour, using hay in the crop sequence, maintaining sod in shallow drainageways, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has high potential productivity for trees, and about half the acreage is wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control erosion.

Slope is the major limitation of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IVe.

AvB—Allegheny Variant sandy loam, 3 to 8 percent slopes. This soil is gently sloping and well drained. It is on foot slopes, in coves, along small drainageways, and on stream terraces. It is in the Cacapon River watershed and in the mountains east of Lost River, mainly in eastern Hardy County.

Typically, the surface layer is dark grayish brown and yellowish brown sandy loam about 6 inches thick. The subsurface layer is pale brown sandy loam about 9 inches thick. The subsoil is about 25 inches thick. The upper 5 inches of the subsoil is yellowish brown sandy loam, and the lower 20 inches is yellowish red sandy loam and pockets of loamy sand. The substratum extends to a depth of 60 inches or more. It consists of very pale brown sand, pinkish gray sandy loam, and yellowish red sandy clay loam.

Included with this soil in mapping are a few areas of Buchanan, Drall, and Schaffenaker soils. Also included are a few areas of stony soils, nearly level soils, and strongly sloping soils. Included soils make up about 30 percent of this map unit.

The available water capacity of this Allegheny Variant soil is low or moderate, and permeability is moderately rapid or rapid. Runoff is medium, and natural fertility is low. Where unlimed, this soil is strongly acid or very strongly acid. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for cultivated crops and hay. Because of droughtiness during summer, however, the soil is better suited to early-maturing small grains than to late-maturing crops such as corn. The hazard of erosion is moderate in unprotected areas and is a major management concern. If the soil is cultivated, cultivating on the contour, using hay in the crop sequence, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control erosion.

This soil has few, if any, limitations for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIe.

AvC—Allegheny Variant sandy loam, 8 to 15 percent slopes. This soil is strongly sloping and well drained. It is on foot slopes, in coves, along small drainageways, and on stream terraces. It is in the Cacapon River Watershed and the mountains east of Lost River, mainly in the eastern part of Hardy County.

Typically, the surface layer is dark grayish brown and yellowish brown sandy loam about 6 inches thick. The subsurface layer is pale brown sandy loam about 9 inches thick. The subsoil is about 25 inches thick. The upper 5 inches of the subsoil is yellowish brown sandy loam, and the lower 20 inches is yellowish red sandy loam and pockets of loamy sand. The substratum extends to a depth of 60 inches or more. It consists of very pale brown sand, pinkish gray sandy loam, and yellowish red sandy clay loam.

Included with this soil in mapping are a few areas of Buchanan, Drall, and Schaffenaker soils. Also included are a few areas of stony soils, gently sloping soils, and moderately steep soils. Included soils make up about 25 percent of this map unit.

The available water capacity of this Allegheny Variant soil is low or moderate, and permeability is moderately rapid or rapid. Runoff is rapid, and natural fertility is low. Where unlimed, this soil is strongly acid or very strongly acid. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for cultivated crops and hay. Because of droughtiness during summer, however, the soil is better suited to early-maturing small grains than to late-maturing crops such as corn. The hazard of erosion is severe in unprotected areas and is a major management concern. If the soil is cultivated, conservation tillage, cultivating on the contour, using hay in the crop sequence, maintaining sod in shallow drainageways, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, but less than half of the acreage is wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control erosion.

Slope is the major limitation of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

Ba—Basher fine sandy loam. This soil is nearly level and moderately well drained. It is on flood plains of small streams throughout the survey area. Slopes range from 0 to 3 percent.

Typically, the surface layer is dark brown fine sandy loam about 11 inches thick. The subsoil is about 31 inches thick. The upper 6 inches of the subsoil is reddish brown fine sandy loam, and the lower 25 inches is reddish brown loam mottled with strong brown and pinkish gray. The substratum extends to a depth of 60 inches or more. Between depths of 42 and 49 inches, it is light brownish gray loamy sand mottled with strong brown. At a depth of more than 49 inches, it is light brownish gray very gravelly sand mottled with strong brown.

Included with this soil in mapping are a few areas of Potomac and Tioga soils and a few areas of poorly drained soils. Included soils make up about 35 percent of this map unit.

The available water capacity of this Basher soil is moderate or high, and permeability is moderate. Runoff is slow, and natural fertility is medium. A seasonal high water table about 1.5 to 2 feet below the surface restricts the root growth of some plants, and the soil is commonly flooded. Where unlimed, this soil is very strongly acid to medium acid in the surface layer and subsoil and very strongly acid to slightly acid in the substratum. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for cultivated crops and hay. Some small wet areas need artificial drainage if desirable crops are to be grown, and crops commonly are subject to damage from flooding. Cultivated crops can be grown continuously on this soil, but the soil needs the protection of a cover crop. Mixing the residue from the cover crop into the soil helps to improve fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has high potential productivity for trees, but it is used almost entirely for cropland.

A hazard of flooding and the seasonal high water table limit this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control stream scouring and sedimentation.

The capability subclass is IIw.

BcE—Belmont-Calvin, high base substratum stony silt loams, 15 to 35 percent slopes. This unit consists of steep or moderately steep, well drained soils on hillsides commonly dissected by drainageways. It is along the eastern edge of Allegheny Mountain in Grant County. Stones cover 1 to 3 percent of the surface of the soils. The unit is about 40 percent Belmont soils, 30 percent Calvin high base substratum soils, and 30 percent other soils. The soils are so intermingled that it was not practical to map them separately.

Typically, the surface layer of the Belmont soils is dark brown silt loam about 4 inches thick. The subsoil is about 39 inches thick. The upper 5 inches of the subsoil is reddish brown silt loam. The next 20 inches is dark reddish brown silty clay loam and silty clay. The lower 14 inches is dark red silty clay loam. The substratum is dark red silty clay loam that extends to bedrock at a depth of about 48 inches.

Typically, the surface layer of the Calvin soils is very dark grayish brown silt loam about 4 inches thick. The subsoil is dark reddish brown and is about 18 inches thick. The upper 12 inches of the subsoil is channery silt loam, and the lower 6 inches is very channery silt loam. The substratum is dark reddish brown very channery silt loam that extends to bedrock at a depth of about 32 inches.

Included with these soils in mapping are a few areas of Shouns soils, soils with no stones on the surface, soils where stones cover more than 3 percent of the surface, strongly sloping or very steep soils, rock outcrop, and soils that are less than 20 inches deep to bedrock. Also included are areas that have fewer rock fragments in the upper part of the subsoil than these Calvin soils do.

The Belmont soils have high available water capacity and moderate permeability. Natural fertility is high, and runoff is rapid or very rapid. The Belmont soils are strongly acid to slightly acid in the surface layer and upper part of the subsoil and medium acid to neutral in the lower part of the subsoil. The substratum is medium acid to mildly alkaline. The depth to bedrock is 40 to 60 inches.

The Calvin soils have moderate available water capacity and moderate permeability. Natural fertility is medium, and runoff is rapid or very rapid. The Calvin soils are medium acid to very strongly acid in the surface layer and upper part of the subsoil and strongly acid to slightly acid in the lower part of the subsoil and in the substratum. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

The soils in this unit generally are not suited to cultivated crops or hay and are difficult to manage for pasture. The soils have high or moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. The use

of equipment is restricted during wet seasons because the soils are soft and slippery. Slope and the stones on the surface also restrict the use of equipment.

Slope, the depth to bedrock, and a shrink-swell potential are the main limitations of these soils for most urban uses. The limestone in some areas is cavernous and allows pollutants from waste-disposal systems to enter the ground water. Maintaining the plant cover, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

BcF—Belmont-Calvin, high base substratum stony silt loams, 35 to 85 percent slopes. This unit consists of very steep, well drained soils on hillsides commonly dissected by drainageways. It is along the eastern edge of the Allegheny Mountains in Grant County. Stones cover 1 to 3 percent of the surface of the soils. The unit is about 40 percent Belmont soils, 30 percent Calvin high base substratum soils, and 30 percent other soils. The soils are so intermingled that it was not practical to map them separately.

Typically, the surface layer of the Belmont soils is dark brown and brown silt loam about 6 inches thick. The subsoil is about 37 inches thick. The upper 4 inches of the subsoil is reddish brown silt loam. The next 18 inches is dark reddish brown silty clay loam and silty clay. The lower 15 inches is dark red silty clay loam. The substratum is dark red silty clay loam that extends to bedrock at a depth of about 48 inches.

Typically, the surface layer of the Calvin soils is very dark grayish brown and dark brown silt loam about 6 inches thick. The subsoil is dark reddish brown and is about 17 inches thick. The upper 12 inches of the subsoil is channery silt loam, and the lower 5 inches is very channery silt loam. The substratum is dark reddish brown very channery silt loam that extends to bedrock at a depth of about 30 inches.

Included with these soils in mapping are a few areas of Shouns soils, soils with no stones on the surface, soils where stones cover more than 3 percent of the surface, steep soils, rock outcrop, and soils that are less than 20 inches deep to bedrock. Also included are areas that have fewer rock fragments in the upper part of the subsoil than the Calvin soils do.

The Belmont soils have high available water capacity and moderate permeability. Natural fertility is high, and runoff is very rapid. The Belmont soils are strongly acid to slightly acid in the surface layer and upper part of the subsoil and medium acid to neutral in the lower part of the subsoil. The substratum is medium acid to mildly alkaline. The depth to bedrock is 40 to 60 inches.

The Calvin soils have moderate available water capacity and moderate permeability. Natural fertility is medium, and runoff is very rapid. The Calvin soils are medium acid to very strongly acid in the surface layer and upper part of the subsoil and strongly acid to slightly acid in the lower part of the subsoil and in the substratum. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

The soils in this unit generally are not suited to cultivated crops or hay and are difficult to manage for pasture. The soils have high or moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because the soils are soft and slippery. Slope and the stones on the surface also restrict the use of equipment.

Slope, the depth to bedrock, and a shrink-swell potential are the main limitations of these soils for most urban uses. The limestone in some areas is cavernous and allows pollutants from waste-disposal systems to enter the ground water. Maintaining the plant cover, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

BkC—Berks channery silt loam, 8 to 15 percent slopes. This soil is strongly sloping and well drained. It is mostly on ridgetops and benches.

Typically, the surface layer is dark brown and grayish brown channery silt loam about 7 inches thick. The subsoil is yellowish brown and is about 18 inches thick. The upper 6 inches of the subsoil is shaly silt loam, and the lower 12 inches is very shaly silt loam. The substratum is yellowish brown very shaly silt loam that extends to bedrock at a depth of about 32 inches.

Included with this soil in mapping are small areas of Calvin, Dekalb, Edom, Ernest, Lenew, Monongahela, and Welkert soils. Some areas of this soil have stones on the surface, and some areas in the Eunice Creek watershed in Grant County are covered with a thin layer of cobbly deposits. Also included are areas of gently sloping and moderately steep soils and a few areas of deep soils. Included soils make up about 30 percent of this map unit.

This Berks soil has low or very low available water capacity, and it is droughty. Permeability is moderate or moderately rapid. Runoff is rapid, and natural fertility is low. Where unlimed, this soil is strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for cultivated crops and hay. Because of droughtiness during summer, however, the soil is better suited to early-maturing small grains than to late-maturing crops such as corn. The hazard of erosion is severe in unprotected areas and is a major management concern. If the soil is cultivated, conservation tillage, cultivating on the contour, using hay

in the crop sequence, maintaining sod in shallow drainageways, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has moderate potential productivity for trees, but most of it is cleared. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control erosion.

Slope and the depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

BkD—Berks channery silt loam, 15 to 25 percent slopes. This soil is moderately steep and well drained. It is on ridgetops, benches, and hillsides throughout the survey area. The benches and hillsides are commonly dissected by drainageways.

Typically, the surface layer is dark brown and grayish brown channery silt loam about 6 inches thick. The subsoil is yellowish brown and is about 17 inches thick. The upper 6 inches of the subsoil is shaly silt loam, and the lower 11 inches is very shaly silt loam. The substratum is yellowish brown very shaly silt loam that extends to bedrock at a depth of about 28 inches.

Included with this soil in mapping are small areas of Calvin, Dekalb, Edom, Ernest, Lehew, Monongahela, and Weikert soils. Some areas of this soil have stones on the surface, and some areas in the Lunice Creek watershed in Grant County are covered with a thin cobbly layer. Also included are a few strongly sloping soils and a few steep soils. Included soils make up about 30 percent of this map unit.

This Berks soil has low or very low available water capacity, and it is droughty. Permeability is moderate or moderately rapid. Runoff is rapid, and natural fertility is low. Where unlimed, this soil is strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture. Because of droughtiness during summer, the soil is better suited to early-maturing small grains than to late-maturing crops such as corn. The hazard of erosion is severe in unprotected areas and is a major management concern. If this soil is cultivated, conservation tillage, contour cultivation, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the major pasture management needs.

This soil has moderate or low potential productivity for trees, and most of the acreage is wooded or reverting to woody species. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

Slope and the depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IVe.

BkE—Berks channery silt loam, 25 to 35 percent slopes. This soil is steep and well drained. It is on hillsides throughout the survey area. The hillsides are commonly dissected by drainageways.

Typically, the surface layer is dark brown and grayish brown channery silt loam about 5 inches thick. The subsoil is yellowish brown and is about 16 inches thick. The upper 5 inches of the subsoil is shaly silt loam, and the lower 11 inches is very shaly silt loam. The substratum is yellowish brown very shaly silt loam that extends to bedrock at a depth of about 26 inches.

Included with this soil in mapping are small areas of Calvin, Dekalb, Edom, Lehew, and Weikert soils. Also included are several areas of stony soils, colluvial soils, moderately steep soils, and very steep soils. Included soils make up about 25 percent of this map unit.

This Berks soil has low or very low available water capacity, and it is droughty. Permeability is moderate or moderately rapid. Runoff is very rapid, and natural fertility is low. This soil is strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

This soil generally is not suited to cultivated crops or hay, but it is suited to pasture. The hazard of erosion is very severe in unprotected areas. Overgrazing of pasture and the hazard of erosion are the major management concerns. Proper stocking rates, rotation grazing, and seeding bare areas to establish a permanent plant cover are the major pasture management needs.

This soil has moderate to low potential productivity for trees, and most of the acreage is wooded or reverting to woody species. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion.

Slope and the depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIe.

BkF—Berks channery silt loam, 35 to 65 percent slopes. This soil is very steep and well drained. It is on hillsides throughout the survey area. The hillsides are commonly dissected by drainageways.

Typically, the surface layer is dark brown and grayish brown channery silt loam about 3 inches thick. The subsoil is yellowish brown and is about 17 inches thick. The upper 5 inches of the subsoil is shaly silt loam, and the lower 12 inches is very shaly silt loam. The substratum is yellowish brown very shaly silt loam that extends to bedrock at a depth of about 25 inches.

Included with this soil in mapping are small areas of Calvin, Dekalb, Lehew, and Weikert soils. Also included are small areas of deep soils, stony soils, colluvial soils, and steep soils. Included soils make up about 25 percent of this map unit.

This Berks soil has low or very low available water capacity, and it is droughty. Permeability is moderate or moderately rapid. Runoff is very rapid, and natural fertility is low. This soil is strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

This soil generally is not suited to cultivated crops or hay and is difficult to manage for pasture. It has moderate to low potential productivity for trees, and most of the acreage is wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

Slope and the depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is VIIe.

BrB—Berks-Weikert shaly silt loams, 3 to 8 percent slopes. This unit consists of gently sloping, well drained soils on ridgetops and benches. The unit is about 40 percent Berks soils, 40 percent Weikert soils, and 20 percent other soiils. The soils are so intermingled that it was not practical to map them separately.

Typically, the surface layer of the Berks soils is dark brown shaly silt loam about 5 inches thick. The subsoil is yellowish brown and is about 19 inches thick. The upper 7 inches of the subsoil is shaly silt loam, and the lower 12 inches is very shaly silt loam. The substratum is yellowish brown very shaly silt loam that extends to bedrock at a depth of about 33 inches.

Typically, the surface layer of the Weikert soils is dark brown shaly silt loam about 4 inches thick. The subsoil is yellowish brown very shaly silt loam about 9 inches thick. The substratum is strong brown very shaly silt loam that extends to bedrock at a depth of about 16 inches.

Included with these soils in mapping are a few areas of Edom soils, nearly level soils, rock outcrops, severely eroded soils, moderately well drained soils, and deep soils. Some areas in the Lunice Creek watershed in Grant County are covered with a thin layer of cobbly soil.

The available water capacity is low or very low in the Berks soils and low in the Weikert soils. Both soils are droughty. Permeability is moderate or moderately rapid in the Berks soils and moderately rapid in the Weikert soils. Runoff is medium on both soils, and natural fertility is low. Where unlimed, both soils are strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Berks soils and 10 to 20 inches in the Weikert soils.

The soils in this unit are suited to cultivated crops but are better suited to and mainly used for hay and pasture. Because of droughtiness in summer, the soils are better suited to early-maturing small grains than to late-maturing crops such as corn. The hazard of erosion is moderate in unprotected areas and is a management concern. If these soils are cultivated, crops in contour, hay in the crop sequence, and crop residue in and on the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the major pasture management needs.

These soils have moderate or low potential productivity for trees, and most of the acreage has been cleared of trees. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The depth to bedrock is the major limitation of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

BrB3—Berks-Weikert shaly silt loams, 3 to 8 percent slopes, severely eroded. This unit consists of gently sloping, well drained soils on ridgetops and benches. Erosion has removed most of the original surface layer of the soils, and the subsoil is exposed in places. The unit is about 40 percent Berks soils, 40 percent Weikert soils, and 20 percent other soils. The soils are so intermingled that it was not practical to map them separately.

Typically, the surface layer of the Berks soils is brown shaly silt loam about 2 inches thick. The subsoil is yellowish brown and is about 16 inches thick. The upper 5 inches of the subsoil is shaly silt loam, and the lower 11 inches is very shaly silt loam. The substratum is yellowish brown very shaly silt loam that extends to bedrock at a depth of about 26 inches.

Typically, the surface layer of the Weikert soils is brown shaly silt loam about 2 inches thick. The subsoil is yellowish brown very shaly silt loam about 8 inches thick. The substratum is strong brown very shaly silt loam that extends to bedrock at a depth of about 14 inches.

Included with these soils in mapping are a few areas of Edom soils, nearly level soils, and rock outcrops.

The available water capacity is low or very low in the Berks soils and very low in the Weikert soils. Both soils are droughty. Permeability is moderate or moderately rapid in the Berks soils and moderately rapid in the Weikert soils. Runoff is medium on both soils, and natural fertility is low. Where unlimed, both soils are strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Berks soils and 10 to 20 inches in the Weikert soils.

The soils in this unit have limited suitability for cultivated crops and are better suited to and mainly used for hay or pasture. Because of droughtiness during summer, the soils are better suited to early-maturing small grains than to late-maturing crops such as corn. The hazard of further erosion is very severe in unprotected areas and is a major management concern. If this soil is cultivated, in contour strips, hay in the crop sequence, and crop residue in and on the soil help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the major pasture management needs.

These soils have moderate or low potential productivity for trees, and most of the acreage has been cleared of trees. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The depth to bedrock is the major limitation of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IVe.

BrC—Berks-Weikert shaly silt loams, 8 to 15 percent slopes. This unit consists of strongly sloping, well drained soils on ridgetops and benches. The unit is about 45 percent Berks soils, 40 percent Weikert soils, and 15 percent other soils. The soils are so intermingled that it was not practical to map them separately.

Typically, the surface layer of the Berks soils is dark brown shaly silt loam about 5 inches thick. The subsoil is yellowish brown and is about 19 inches thick. The upper 7 inches of the subsoil is shaly silt loam, and the lower 12 inches is very shaly silt loam. The substratum is yellowish brown very shaly silt loam that extends to bedrock at a depth of about 33 inches.

Typically, the surface layer of the Weikert soils is dark brown shaly silt loam about 4 inches thick. The subsoil is yellowish brown very shaly silt loam about 9 inches thick. The substratum is strong brown very shaly silt loam that extends to bedrock at a depth of about 16 inches.

Included with these soils in mapping are a few areas of Edom soils, gently sloping soils, moderately steep soils, and rock outcrops. Also included are a few severely eroded soils, moderately well drained soils, and deep soils. Some areas in the Lunice Creek watershed in Grant County are covered with a thin layer of cobbly soil.

The available water capacity is low or very low in the Berks soils and very low in the Weikert soils. Both soils are droughty. Permeability is moderate or moderately rapid in the Berks soils and moderately rapid in the Weikert soils. Runoff is rapid on both soils, and natural fertility is low. Where unlimed, both soils are strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Berks soils and 10 to 20 inches in the Weikert soils.

The soils in this unit have limited suitability for cultivated crops and are better suited to and mainly used for hay or pasture. Because of droughtiness during summer, the soils are better suited to early-maturing small grains than to late-maturing crops such as corn. The hazard of erosion is severe in unprotected areas and is a major management concern. If these soils are cultivated, crops in contour strips, hay in the crop sequence, sod in shallow drainageways, and crop residue in or on the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the major pasture management needs.

These soils have moderate or low potential productivity for trees, and most of the acreage has been cleared of trees. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion.

The depth to bedrock and slope are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IVe.

BrC3—Berks-Weikert shaly silt loams, 8 to 15 percent slopes, severely eroded. This unit consists of strongly sloping, well drained soils on ridgetops and benches. Erosion has removed most of the original surface layer of the soils, and in places the subsoil is exposed or the soil is gullied. The unit is about 40 percent Berks soils, 40 percent Weikert soils, and 20 percent other soils. The soils are so intermingled that it was not practical to map them separately.

Typically, the surface layer of the Berks soils is brown shaly silt loam about 2 inches thick. The subsoil is yellowish brown and is about 16 inches thick. The upper 5 inches of the subsoil is shaly silt loam, and the lower 11 inches is very shaly silt loam. The substratum is yellowish brown very shaly silt loam that extends to bedrock at a depth of about 26 inches.

Typically, the surface layer of the Weikert soils is brown shaly silt loam about 2 inches thick. The subsoil is yellowish brown very shaly silt loam about 8 inches thick.

The substratum is strong brown very shaly silt loam that extends to bedrock at a depth of about 14 inches.

Included with these soils in mapping are a few areas of Edom soils, gently sloping soils, moderately steep soils, and rock outcrops.

The available water capacity is low or very low in the Berks soils and very low in the Weikert soils. Both soils are droughty. Permeability is moderate or moderately rapid in the Berks soils and moderately rapid in the Weikert soils. Runoff is rapid on both soils, and natural fertility is low. Where unlimed, both soils are strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Berks soils and 10 to 20 inches in the Weikert soils.

The soils in this unit generally are not suited to cultivated crops but are suited to and used mainly for pasture and hay. The hazard of further erosion is very severe in unprotected areas and is a major management concern. Proper stocking rates and rotation grazing are the major pasture management needs.

The soils in this unit have moderate or low potential productivity for trees, and most of the acreage has been cleared of trees. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion.

The depth to bedrock and slope are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentaion.

The capability subclass is VIe.

BrD—Berks-Weikert shaly silt loams, 15 to 25 percent slopes. This unit consists of moderately steep, well drained soils on ridgetops, benches, and hillsides. Drainageways commonly dissect the benches and hillsides. The unit is about 45 percent Berks soils, 40 percent Weikert soils, and 15 percent other soils. The soils are so intermingled that it was not practical to map them separately.

Typically, the surface layer of the Berks soils is dark brown shaly silt loam about 4 inches thick. The subsoil is yellowish brown and is about 16 inches thick. The upper 6 inches of the subsoil is shaly silt loam, and the lower 10 inches is very shaly silt loam. The substratum is yellowish brown very shaly silt loam that extends to bedrock at a depth of about 28 inches.

Typically, the surface layer of the Weikert soils is dark brown shaly silt loam about 3 inches thick. The subsoil is yellowish brown very shaly silt loam about 8 inches thick. The substratum is strong brown very shaly silt loam that extends to bedrock at a depth of about 14 inches.

Included with these soils in mapping are a few areas of Edom soils, strongly sloping soils, steep soils, and rock outcrops. Also included are a few severely eroded soils, moderately well drained soils, and deep soils. Some areas in the Lunice Creek watershed in Grant County are covered with a thin layer of cobbly soil.

The available water capacity is low or very low in the Berks soils and very low in the Weikert soils. Both soils are droughty. Permeability is moderate or moderately rapid in the Berks soils and moderately rapid in the Weikert soils. Runoff is rapid on both soils, and natural fertility is low. Where unlimed, both soils are strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Berks soils and 10 to 20 inches in the Weikert soils.

The soils in this unit are not suited to cultivated crops but are suited to and used mainly for pasture or hay. The hazard of erosion is severe in unprotected areas and is a major management concern. Proper stocking rates and rotation grazing are the major pasture management needs.

The soils in this complex have very low to moderate potential productivity for trees, and about half of the acreage is wooded or reverting to woody species (fig. 4). Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The depth to bedrock and slope are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIe.

BrD3—Berks-Weikert shaly silt loams, 15 to 25 percent slopes, severely eroded. This unit consists of moderately steep, well drained soils on ridgetops, benches, and hillsides. Erosion has removed most of the original surface layer of the soils, and in places the subsoil is exposed or the soil is gullied. Drainageways commonly dissect the benches and hillsides. The unit is about 40 percent Berks soils, 40 percent Weikert soils, and 20 percent other soils. The soils are so intermingled that it was not practical to map them separately.

Typically, the surface layer of the Berks soils is brown shaly silt loam about 2 inches thick. The subsoil is yellowish brown and is about 16 inches thick. The upper 5 inches of the subsoil is shaly silt loam, and the lower 11 inches is very shaly silt loam. The substratum is yellowish brown very shaly silt loam that extends to bedrock at a depth of about 26 inches.

Typically, the surface layer of the Weikert soils is brown shaly silt loam about 1 inch thick. The subsoil is yellowish brown very shaly silt loam about 8 inches thick. The substratum is strong brown very shaly silt loam that extends to bedrock at a depth of about 13 inches.

Included with these soils in mapping are a few areas of Edom soils, strongly sloping soils, steep soils, and rock outcrops.

Figure 4.—An area of Berks-Weikert shaly silt loams, 15 to 25 percent slopes.

The available water capacity is low or very low in the Berks soils and very low in the Weikert soils. Both soils are droughty. Permeability is moderate or moderately rapid in the Berks soils and moderately rapid in the Weikert soils. Runoff is rapid on both soils, and natural fertility is low. Where unlimed, both soils are strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Berks soils and 10 to 20 inches in the Weikert soils.

The soils in this unit generally are not suited to cultivated crops or hay and are difficult to manage for pasture. The hazard of further erosion is very severe in unprotected areas and is a major management concern. Proper stocking rates and rotation grazing are the major pasture management needs.

The soils in this unit have very low to moderate potential productivity for trees. About half of the acreage is wooded or reverting to woody species. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The depth to bedrock and slope are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIe.

BrF—Berks-Weikert shaly silt loams, 25 to 65 percent slopes. This unit consists of very steep or steep, well drained soils on hillsides. Drainageways commonly dissect the hillsides. Most of the Berks soils are on the north-facing slopes, and most of the Weikert soils are on the south-facing slopes. This unit is about 45 percent Berks soils, 40 percent Weikert soils, and 15 percent other soils. The soils are so intermingled that it was not practical to map them separately.

Typically, the surface layer of the Berks soils is dark brown and grayish brown shaly silt loam about 3 inches thick. The subsoil is yellowish brown and is about 17 inches thick. The upper 5 inches of the subsoil is shaly silt loam, and the lower 12 inches is very shaly silt loam. The substratum is yellowish brown very shaly silt loam that extends to bedrock at a depth of about 25 inches.

Typically, the surface layer of the Weikert soils is dark brown and grayish brown shaly silt loam about 5 inches thick. The subsoil is yellowish brown very shaly silt loam about 4 inches thick. The substratum is strong brown

very shaly silt loam that extends to bedrock at a depth of about 17 inches.

Included with these soils in mapping are a few areas of Edom soils, moderately steep soils, stony soils, and rock outcrop. Also included are a few severely eroded soils and deep soils.

The available water capacity is low or very low in the Berks soils and very low in the Weikert soils. Both soils are droughty. Permeability is moderate or moderately rapid in the Berks soils and moderately rapid in the Weikert soils. Runoff is very rapid on both soils, and natural fertility is low. The soils are strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Berks soils and 10 to 20 inches in the Weikert soils.

The soils in this unit generally are not suited to cultivated crops or hay and are difficult to manage for pasture. The hazard of erosion is very severe in unprotected areas. The soils have very low to moderate potential productivity for trees, and most of the acreage is used for woodland. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

Slope and the depth to bedrock are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is VIIe.

BrF3—Berks-Weikert shaly silt loams, 25 to 65 percent slopes, severely eroded. This unit consists of very steep or steep, well drained soils on hillsides. Erosion has removed most of the original surface layer of the soils, and in places the subsoil is exposed or the soil is gullied. Drainageways commonly dissect the hillsides. Most of the Berks soil are on the north-facing slopes, and most of the Weikert soils are on the south-facing slopes. This unit is about 45 percent Berks soils, 45 percent Weikert soils, and 10 percent other soils. The soils are so intermingled that it was not practical to map them separately.

Typically, the surface layer of the Berks soils is brown shaly silt loam about 2 inches thick. The subsoil is yellowish brown and is about 16 inches thick. The upper 5 inches of the subsoil is shaly silt loam, and the lower 11 inches is very shaly silt loam. The substratum is yellowish brown very shaly silt loam that extends to bedrock at a depth of about 23 inches.

Typically, the surface layer of the Weikert soils is brown and grayish brown shaly silt loam about 4 inches thick. The subsoil is yellowish brown very shaly silt loam about 4 inches thick. The substratum is strong brown very shaly silt loam that extends to bedrock at a depth of about 13 inches.

Included with these soils in mapping are a few areas of Edom soils, moderately steep soils, rock outcrops, and moderately eroded soils.

The available water capacity is low or very low in the Berks soils and very low in the Weikert soils. Both soils are droughty. Permeability is moderate or moderately rapid in the Berks soils and moderately rapid in the Weikert soils. Runoff is very rapid on both soils, and natural fertility is low. These soils are strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Berks soils and 10 to 20 inches in the Weikert soils.

The soils in this unit generally are not suited to cultivated crops or hay and are difficult to manage for pasture. The hazard of further erosion is very severe in unprotected areas. The soils have very low to moderate potential productivity for trees, and most of the area is used for woodland or is reverting to woody species. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope and depth to bedrock are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIe.

BsB—Brinkerton Variant silt loam, 3 to 8 percent slopes. This soil is gently sloping and somewhat poorly drained or poorly drained. It is in coves, along foot slopes, and along small drainageways.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil is about 35 inches thick. The upper 13 inches of the subsoil is strong brown silty clay mottled with gray, grayish brown, red, and black. The lower 22 inches is gray channery silt clay mottled with strong brown, yellowish red, and black. The substratum extends to a depth of 60 inches or more. It is gray silty clay and shaly silty clay mottled with strong brown, grayish brown, yellowish red, and light olive brown.

Included with this soil in mapping are a few areas of Clarksburg soils, stony soils, strongly sloping soils, and strongly acid or very strongly acid soils. Also included are a few soils that contain less clay than this Brinkerton Variant soil does. Included soils make up about 20 percent of this map unit.

The available water capacity of this Brinkerton Variant soil is high. Permeability is slow or moderately slow. Runoff is medium, and natural fertility is high. This soil has a seasonal high water table within 1 foot of the surface which restricts the root growth of plants. This soil is medium acid to neutral in the surface layer and subsoil and medium acid to mildly alkaline in the

substratum. The depth to bedrock is more than 60 inches.

If adequately drained, this soil is suited to cultivated crops and to hay and pasture, especially water-tolerant grasses and legumes. Draining the soil is difficult, however, because of the clayey subsoil. The hazard of erosion is moderate in unprotected areas and is a major management concern. If the soil is cultivated, conservation tillage, cultivating on the contour, using hay in the crop sequence, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Most areas are used for pasture. Proper stocking rates, rotation grazing, and deferred grazing until the soil is firm are the main pasture management needs.

This soil has high potential productivity for trees that tolerate wetness. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because this soil is soft.

The seasonal high water table, the permeability, and low strength are the major limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is IIIw.

BuB—Buchanan channery loam, 3 to 8 percent slopes. This soil is gently sloping and moderately well drained. It is on foot slopes, in coves, and along drainageways. Seep spots are common.

Typically, the surface layer is black channery loam about 2 inches thick. The subsurface layer is brown channery loam 3 inches thick. The subsoil is about 43 inches thick. In sequence downward, it is 5 inches of pale brown channery loam; 4 inches of pale brown channery loam mottled with reddish yellow; 6 inches of pale brown channery loam mottled with strong brown and light brownish gray; 12 inches of yellowish brown, very firm and brittle channery sandy clay loam mottled with light brownish gray and strong brown; and 16 inches of light yellowish brown, very firm and brittle channery loam mottled with light brownish gray. The substratum extends to a depth of 60 inches or more. It is light yellowish brown, firm very channery sandy clay loam mottled with light brownish gray.

Included with this soil in mapping are a few areas of Laidig soils and a few soils in which the subsoil is friable throughout. Also included are a few stony soils, nearly level soils, strongly sloping soils, and poorly drained soils. Included soils make up about 20 percent of this map unit.

The available water capacity of this Buchanan soil is moderate. Permeability is moderate above the firm part of the subsoil and slow in the firm part. Runoff is medium, and natural fertility is low. Where unlimed, the soil is extremely acid to strongly acid. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of plants. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for pasture and hay. The hazard of erosion is moderate in cultivated areas and is a management concern. If this soil is cultivated, cultivating on the contour, using hay in the crop sequence, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The seasonal high water table and slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is IIe.

BuC—Buchanan channery loam, 8 to 15 percent slopes. This soil is strongly sloping and moderately well drained. It is on foot slopes, in coves, and along drainageways. Seep spots are common on this soil.

Typically, the surface layer is black channery loam about 2 inches thick. The subsurface layer is brown channery loam 3 inches thick. The subsoil is about 43 inches thick. In sequence downward, it is 5 inches of pale brown channery loam; 4 inches of pale brown channery loam mottled with reddish yellow; 6 inches of pale brown channery loam mottled with strong brown and light brownish gray; 12 inches of yellowish brown, very firm and brittle channery sandy clay loam mottled with light brownish gray and strong brown; and 16 inches of light yellowish brown, very firm and brittle channery loam mottled with light brownish gray. The substratum extends to a depth of 60 inches or more. It is light yellowish brown, firm very channery sandy clay loam mottled with light brownish gray.

Included with this soil in mapping are a few areas of Laidig soils and soils in which the subsoil is friable throughout. Also included are a few stony soils, gently sloping soils, moderately steep soils, and poorly drained soils. Included soils make up about 20 percent of this map unit.

The available water capacity of this Buchanan soil is moderate. Permeability is moderate above the firm part of the subsoil and slow in the firm part. Runoff is rapid, and natural fertility is low. Where unlimed, the soil is extremely acid to strongly acid. A seasonal high water

table about 1.5 to 3 feet below the surface restricts the root growth of plants. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay or pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, and it is mostly wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The seasonal high water table and slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is IIIe.

BvC—Buchanan stony loam, 3 to 15 percent slopes. This soil is strongly sloping or gently sloping and is moderately well drained. It is on foot slopes, in coves, and along drainageways. Seep spots are common. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is black channery loam about 2 inches thick. The subsurface layer is brown channery loam 3 inches thick. The subsoil is about 43 inches thick. In sequence downward, it is 5 inches of pale brown channery loam; 4 inches of pale brown channery loam mottled with reddish yellow; 6 inches of pale brown channery loam mottled with strong brown and light brownish gray; 12 inches of yellowish brown, very firm and brittle channery sandy clay loam mottled with light brownish gray and strong brown; and 16 inches of light yellowish brown, very firm and brittle channery loam mottled with light brownish gray. The substratum extends to a depth of 60 inches or more. It is light yellowish brown, firm very channery sandy clay loam mottled with light brownish gray.

Included with this soil in mapping are a few areas of Ernest and Laidig soils and soils in which the subsoil is friable throughout. Also included are several areas of poorly drained soils, soils where stones cover more than 3 percent of the surface, soils with no stones on the surface, and moderately steep soils. Included soils make up about 20 percent of this map unit.

The available water capacity of this Buchanan soil is moderate. Permeability is moderate above the firm part of the subsoil and slow in the firm part. Runoff is medium or rapid, and natural fertility is low. Where unlimed, the soil is extremely acid to strongly acid. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of plants. The depth to bedrock is more than 60 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The hazard of erosion is moderate or severe in unprotected areas and is a management concern. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope, slow permeability, and seasonal high water table are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

BvD—Buchanan stony loam, 15 to 25 percent slopes. This soil is moderately steep and moderately well drained. It is on foot slopes, in coves, and along drainageways. Seep spots are common. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is black channery loam about 2 inches thick. The subsurface layer is brown channery loam 3 inches thick. The subsoil is about 43 inches thick. In sequence downward, it is 5 inches of pale brown channery loam; 4 inches of pale brown channery loam mottled with reddish yellow; 6 inches of pale brown channery loam mottled with strong brown and light brownish gray; 12 inches of yellowish brown, very firm and brittle channery sandy clay loam mottled with light brownish gray and strong brown; and 16 inches of light yellowish brown, very firm and brittle channery loam mottled with light brownish gray. The substratum extends to a depth of 60 inches or more. It is light yellowish brown, firm very channery sandy clay loam mottled with light brownish gray.

Included with this soil in mapping are a few areas of Berks, Dekalb, Ernest, and Laidig soils. Also included are a few soils in which the subsoil is friable throughout, a few soils with no stones on the surface, a few soils where stones cover more than 3 percent of the surface, and a few steep soils. Included soils make up about 20 percent of this map unit.

The available water capacity of this Buchanan soil is moderate. Permeability is moderate above the firm part of the subsoil and slow in the firm part. Runoff is rapid, and natural fertility is low. Where unlimed, the soil is extremely acid to strongly acid. A seasonal high water

table about 1.5 to 3 feet below the surface restricts the root growth of plants. The depth to bedrock is more than 60 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The hazard of erosion is moderate or severe in unprotected areas and is a management concern. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The seasonal high water table, slow permeability, and slope are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is VIs.

ByB—Buchanan Variant rubbly loam, 3 to 15 percent slopes. This soil is gently sloping or strongly sloping and is somewhat poorly drained or poorly drained. It is on foot slopes, in coves, and along drainageways. Stones and boulders cover 15 to 90 percent of the surface of this soil, but they dominantly cover more than 50 percent. Many of the stones are more than 2 feet in diameter, especially those along the Tucker County line near Stony River Dam.

Typically, the surface layer is black loam about 2 inches thick. The subsurface layer is grayish brown silt loam about 4 inches thick. The subsoil is about 26 inches thick. The upper 4 inches of the subsoil is strong brown sandy clay loam mottled with grayish brown. The next 7 inches is strong brown clay loam mottled with grayish brown. The lower 15 inches is dark yellowish brown, firm and very firm and brittle channery loam mottled with grayish brown. The substratum extends to a depth of 60 inches or more. It is dark brown gravelly loam mottled with grayish brown.

Included with this soil in mapping are a few small areas of Clymer and Wharton soils and a few soils along the Tucker County line near Stony River Dam that are loamy sand in the upper 18 inches. Also included are small areas of rubble land, soils with no stones on the surface, nearly level soils, and strongly sloping soils. Included soils make up about 15 percent of this map unit.

The available water capacity of this Buchanan Variant soil is moderate. Permeability is moderate above the firm part of the subsoil and slow in the firm part. Runoff is medium or rapid, and natural fertility is low. This soil is strongly acid to extremely acid. A seasonal high water table within 1 foot of the surface restricts the root growth of plants. The depth to bedrock is generally more than 60 inches.

The stones and boulders on the surface make this soil generally unsuited to cultivated crops, hay, or pasture. The soil has moderate potential productivity for water-tolerant trees, and most areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour helps to control this erosion. The stones on the surface and wetness restrict the use of equipment and are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is VIIs.

CaC—Calvin channery silt loam, 8 to 15 percent slopes. This soil is strongly sloping and well drained. It is mostly on ridgetops and benches.

Typically, the surface layer is dark reddish brown channery silt loam about 6 inches thick. The subsoil is about 17 inches thick. The upper 8 inches of the subsoil is reddish brown shaly loam, and the lower 9 inches is dark reddish brown very shaly silt loam. The substratum is reddish brown very shaly silt loam that extends to bedrock at a depth of about 34 inches.

Included with this soil in mapping are several areas of Berks, Dekalb, and Lehew soils. Also included are several areas of shallow soils, severely eroded soils, gently sloping soils, and moderately steep soils. Included soils make up about 20 percent of this map unit.

The available water capacity of this Calvin soil is low or moderate. Permeability is moderately rapid. Runoff is rapid, and natural fertility is low. Where unlimed, this soil is medium acid to very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for pasture and hay. Because of droughtiness during summer, however, the soil is better suited to early-maturing small grains than to late-maturing crops such as corn. The hazard of erosion is severe in unprotected areas and is a major management concern. If the soil is cultivated, conservation tillage, cultivating on the contour, using hay in the crop sequence, using sod in shallow drainageways, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has moderate potential productivity for trees, but most of it has been cleared. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope and depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is IIIe.

CaD—Calvin channery silt loam, 15 to 25 percent slopes. This soil is moderately steep and well drained. It is on ridgetops, benches, and hillsides. Drainageways commonly dissect the benches and hillsides.

Typically, the surface layer is dark reddish brown channery silt loam about 5 inches thick. The subsoil is about 16 inches thick. The upper 7 inches of the subsoil is reddish brown shaly loam, and the lower 9 inches is dark reddish brown very shaly silt loam. The substratum is reddish brown very shaly silt loam that extends to bedrock at a depth of about 36 inches.

Included with this soil in mapping are several areas of Berks, Dekalb, and Lehew soils. Also included are several areas of shallow soils, severely eroded soils, strongly sloping soils, and steep soils. Included soils make up about 25 percent of this map unit.

The available water capacity of this Calvin soil is low or moderate. Permeability is moderately rapid. Runoff is rapid, and natural fertility is low. Where unlimed, this soil is medium acid to very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture. It is used mainly for pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has low or moderate potential productivity for trees, but most of it has been cleared. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope and depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is IVe.

CaE—Calvin channery silt loam, 25 to 35 percent slopes. This soil is steep and well drained. It is on hillsides that are commonly dissected by drainageways.

Typically, the surface layer is dark brown and reddish brown channery silt loam about 5 inches thick. The subsoil is about 15 inches thick. The upper 6 inches of the subsoil is reddish brown shaly loam, and the lower 9 inches is dark reddish brown very shaly silt loam. The substratum is reddish brown very shaly silt loam that extends to bedrock at a depth of about 38 inches.

Included with this soil in mapping are several areas of Berks, Dekalb, and Lehew soils. Also included are several areas of shallow soils, severely eroded soils, moderately steep soils, very steep soils, and stony soils. Included soils make up about 30 percent of this map unit.

The available water capacity of this Calvin soil is low or moderate. Permeability is moderately rapid. Runoff is very rapid, and natural fertility is low. This soil is medium acid to very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

This soil is not suited to cultivated crops or hay, but it is suited to pasture. Overgrazing of the pasture and a severe erosion hazard in unprotected areas are the major management concerns. Proper stocking rates, rotation grazing, and establishing a permanent plant cover on bare areas are the major pasture management needs.

This soil has low or moderate potential productivity for trees, and most of it is wooded or reverting to woody species. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope and depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is VIe.

CaF—Calvin channery silt loam, 35 to 65 percent slopes. This soil is very steep and well drained. It is on hillsides that are commonly dissected by drainageways.

Typically, the surface layer is dark brown and reddish brown channery silt loam about 7 inches thick. The subsoil is about 15 inches thick. The upper 6 inches of the subsoil is reddish brown shaly loam, and the lower 9 inches is dark reddish brown very shaly silt loam. The substratum is reddish brown very shaly silt loam that extends to bedrock at a depth of about 38 inches.

Included with this soil in mapping are several areas of Berks, Dekalb, and Lehew soils. Also included are several areas of shallow soils, severely eroded soils, steep soils, and stony soils. Included soils make up about 30 percent of this map unit.

The available water capacity of this Calvin soil is low or moderate. Permeability is moderately rapid. Runoff is very rapid, and natural fertility is low. This soil is medium

acid to very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

This soil is not suited to cultivated crops or hay and is difficult to manage for pasture. The soil has low or moderate potential productivity for trees, and most of the acreage is wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope and depth to bedrock are the main limitations of this soil for most urban uses. Maintaining plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is VIIe.

CdB—Cavode silt loam, 3 to 8 percent slopes. This soil is gently sloping and somewhat poorly drained. It is in slight depressions, on ridgetops, and on benches, mainly on Allegheny Mountain in the western part of Grant County.

Typically, the surface layer is very dark gray silt loam about 6 inches thick. The subsoil is about 33 inches thick. The upper 5 inches of the subsoil is yellowish brown silty clay loam mottled with strong brown and light brownish gray. The next 14 inches is light brownish gray silty clay mottled with strong brown and red. The lower 14 inches is light brownish gray channery silty clay loam mottled with strong brown and red. The substratum extends to a depth of 60 inches or more. It is light brownish gray channery silty clay loam mottled with strong brown.

Included with this soil in mapping are a few soils that have a very firm and brittle subsoil, a few stony soils, a few nearly level soils, and a few strongly sloping soils. Included soils make up about 15 percent of this map unit.

The available water capacity of this Cavode soil is moderate to high. Permeability is slow. Runoff is medium, and natural fertility is low. Where unlimed, this soil is strongly acid or very strongly acid. A seasonal high water table about 6 to 18 inches below the surface restricts the root growth of plants. The depth to bedrock is generally more than 48 inches.

If adequately drained, this soil is suited to cultivatd crops and to hay and pasture. Draining the soil is difficult, however, because of the clayey subsoil. The hazard of erosion is moderate in unprotected areas and is a major management concern. If the soil is cultivated, cultivating on the contour, using hay in the crop sequence, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates, rotation grazing, and deferred grazing until the soil is firm are the main pasture management needs.

This soil has high potential productivity for trees, but most of it has been cleared. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because the soil is soft.

The seasonal high water table and slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is IIIw.

CeB—Cavode stony silt loam, 3 to 8 percent slopes. This soil is gently sloping and somewhat poorly drained. It is on ridgetops, on benches, and in depressions, mainly on Allegheny Mountain in the western part of Grant County. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark gray and brown silt loam about 5 inches thick. The subsoil is about 34 inches thick. The upper 6 inches of the subsoil is yellowish brown silty clay loam mottled with light brownish gray and strong brown. The next 14 inches is light brownish gray silty clay mottled with strong brown and red. The lower 14 inches is light brownish gray channery silty clay loam mottled with strong brown and red. The substratum extends to a depth of 60 inches or more. It is light brownish gray channery silty clay loam mottled with strong brown.

Included with this soil in mapping are a few soils that have a very firm and brittle subsoil, a few soils with no stones on the surface, a few moderately well drained soils, a few nearly level soils, and a few medium-acid soils. Included soils make up about 30 percent of this map unit.

The available water capacity of this Cavode soil is moderate to high. Permeability is slow. Runoff is medium, and natural fertility is low. Where unlimed, this soil is strongly acid or very strongly acid. A seasonal high water table about 6 to 18 inches below the surface restricts the root growth of plants. The depth to bedrock is generally more than 48 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The hazard of erosion is moderate or severe in unprotected areas and is a management concern. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because the soil is soft and slippery.

The seasonal high water table, the slow permeability, and low strength are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

Cg—Chagrin loam. This soil is nearly level and well drained. It is on flood plains in the eastern and central parts of Grant County and in Hardy County. Slopes range from 0 to 3 percent.

Typically, the surface layer is dark brown loam about 11 inches thick. The subsoil is dark brown and brown loam about 27 inches thick. The substratum is brown fine sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are a few areas of Huntington, Lindside, Lobdell, and Tioga soils. Also included are a few soils with a very gravelly subsoil and a few shallow soils. Included soils make up about 20 percent of this map unit.

The available water capacity of this Chagrin soil is high. Permeability is moderate. Runoff is slow, and natural fertility is high. Where unlimed, this soil is medium acid to neutral. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for cultivated crops. They can be grown continuously, but the soil needs the protection of a cover crop. Mixing the residue of the cover crop into the soil helps to improve fertility and tilth. Flooding damages crops in some areas. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has very high potential productivity for trees, but only a small acreage is wooded.

A hazard of flooding is the main limitation of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control stream scouring and sedimentation.

The capability subclass is IIw.

CkB—Clarksburg channery silt loam, 3 to 8 percent slopes. This soil is gently sloping and moderately well drained. It is along foot slopes, in coves, and along drainageways.

Typically, the surface layer is very dark grayish brown channery silt loam about 9 inches thick. The subsoil is about 49 inches thick. In sequence downward, it is 13 inches of yellowish brown channery loam; 7 inches of brownish yellow clay loam; and 29 inches of light yellowish brown and yellowish brown, very firm and brittle clay loam mottled with yellowish red and pinkish gray. The substratum extends to a depth of 60 inches or more. It is strong brown, firm silty clay loam mottled with red.

Included with this soil in mapping are a few areas of Brinkerton Variant, Ernest, and Laidig soils. Also included are a few strongly sloping soils, stony soils, and red soils. Included soils make up about 30 percent of this map unit.

The available water capacity of this Clarksburg soil is moderate. Permeability is moderate above the firm part of the subsoil and moderately slow or slow in the firm part. Runoff is medium, and natural fertility is medium. Where unlimed, the soil is strongly acid to slightly acid. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some plants. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for hay and pasture. The hazard of erosion is moderate in cultivated areas and is a management concern. If this soil is cultivated, cultivating on the contour, using hay in the crop sequence, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during the wet seasons because the soil is soft.

The seasonal high water table and moderately slow or slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIe.

CkC—Clarksburg channery silt loam, 8 to 15 percent slopes. This soil is strongly sloping and moderately well drained. It is along foot slopes, in coves, and along drainageways.

Typically, the surface layer is very dark grayish brown channery silt loam about 7 inches thick. The subsoil is about 45 inches thick. In sequence downward, it is 11 inches of yellowish brown channery loam; 6 inches of brownish yellow clay loam; and 28 inches of light yellowish brown and yellowish brown, very firm and brittle clay loam mottled with yellowish red and pinkish gray. The substratum extends to a depth of 60 inches or more. It is strong brown, firm silty clay loam mottled with red.

Included with this soil in mapping are a few areas of Brinkerton Variant, Ernest, and Laidig soils. Also included are a few moderately steep soils, stony soils, and red

soils. Included soils make up about 30 percent of this map unit.

The available water capacity of this Clarksburg soil is moderate. Permeability is moderate above the firm part of the subsoil and moderately slow or slow in the firm part. Runoff is rapid, and natural fertility is medium. Where unlimed, the soil is strongly acid to slightly acid. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some plants. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay or pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, cultivating on the contour, using hay in the crop sequence, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because this soil is soft.

The seasonal high water table, slope, and moderately slow or slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

CIC—Clarksburg stony silt loam, 3 to 15 percent slopes. This soil is strongly sloping or gently sloping and is moderately well drained. It is along foot slopes, in coves, and along drainageways. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark grayish brown channery silt loam about 4 inches thick. The subsoil is about 49 inches thick. In sequence downward, it is 13 inches of yellowish brown channery loam; 7 inches of brownish yellow clay loam; and 29 inches of light yellowish brown and yellowish brown, very firm and brittle clay loam mottled with yellowish red and pinkish gray. The substratum extends to a depth of 60 inches or more. It is strong brown, firm silty clay loam mottled with red.

Included with this soil in mapping are a few areas of Brinkerton Variant, Ernest, and Laidig soils. Also included are a few moderately steep soils, soils with no stones on the surface, soils where stones cover more than 3 percent of the surface, and red soils. Included soils make up about 30 percent of this map unit.

The available water capacity of this Clarksburg soil is moderate. Permeability is moderate above the firm part of the subsoil and moderately slow or slow in the firm part. Runoff is rapid, and natural fertility is medium. Where unlimed, the soil is strongly acid to slightly acid. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some plants. The depth to bedrock is more than 60 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to and used for pasture. The hazard of erosion is moderate or severe in unprotected areas and is a management concern. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, and some areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour helps to control this erosion. The use of equipment is restricted during wet seasons because this soil is soft.

The seasonal high water table, slope, and moderately slow or slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

CID—Clarksburg stony silt loam, 15 to 25 percent slopes. This soil is moderately steep and moderately well drained. It is along foot slopes, in coves, and along drainageways. Stones cover 1 to 3 percent of the surface of the soil.

Typically, the surface layer is very dark grayish brown channery silt loam about 4 inches thick. The subsoil is about 49 inches thick. In sequence downward, it is 13 inches of yellowish brown channery loam; 7 inches of brownish yellow clay loam; and 29 inches of light yellowish brown and yellowish brown, very firm and brittle clay loam mottled with yellowish red and pinkish gray. The substratum extends to a depth of 60 inches or more. It is strong brown, firm silty clay loam mottled with red.

Included with this soil in mapping are a few areas of Ernest and Laidig soils. Also included are a few steep soils, soils in which the subsoil is friable throughout or is silty clay, soils where stones cover more than 3 percent of the surface, and red soils. Included soils make up about 35 percent of this map unit.

The available water capacity of this Clarksburg soil is moderate. Permeability is moderate above the firm part of the subsoil and moderately slow or slow in the firm part. Runoff is rapid, and natural fertility is medium. Where unlimed, the soil is strongly acid to slightly acid. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some plants. The depth to bedrock is more than 60 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to and used for pasture. The hazard of erosion is severe in unprotected areas and is a management concern. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, and some areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment. Its use is also restricted during wet seasons because this soil is soft.

The slope, moderately slow or slow permeability, and seasonal high water table are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

CsB—Clymer stony loam, 3 to 15 percent slopes. This soil is gently sloping or strongly sloping and is well drained. It is on broad ridgetops and benches on Allegheny Mountain in the western part of Grant County. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark gray loam about 2 inches. The subsurface layer is brown loam about 4 inches thick. The subsoil is 47 inches thick. The upper 15 inches of the subsoil is yellowish brown loam and channery loam. The lower 32 inches is yellowish brown and strong brown sandy clay loam and channery sandy clay loam. The substratum is yellowish brown channery sandy clay loam to a depth of 60 inches or more.

Included with this soil in mapping are a few areas of Dekalb, Hazleton, and Wharton soils. Also included are a few soils with no stones on the surface, level soils, moderately steep soils, soils where stones cover more than 3 percent of the surface, and moderately deep soils. Included soils make up about 30 percent of this map unit.

The available water capacity of this Clymer soil is moderate or high. Permeability is moderate or moderately rapid. Runoff is medium or rapid, and natural fertility is low. Where unlimed, this soil is strongly acid to extremely acid. The depth to bedrock ranges from 42 to 72 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The hazard of erosion is moderate or severe in unprotected areas and is a management concern. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The depth to bedrock and slope are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

CsD—Clymer stony loam, 15 to 35 percent slopes. This soil is moderately steep or steep and is well drained. It is on benches and hillsides on Allegheny Mountain in the western part of Grant County. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark gray loam about 2 inches thick. The subsurface layer is brown loam about 3 inches thick. The subsoil is 35 inches thick. The upper 15 inches of the subsoil is yellowish brown loam and channery loam. The lower 20 inches is yellowish brown and strong brown sandy clay loam and channery sandy clay loam. The substratum is yellowish brown channery sandy clay loam to a depth of 60 inches or more.

Included with this soil in mapping are a few areas of Dekalb, Gilpin, Hazleton, and Wharton soils. Also included are a few areas of strongly sloping soils, very steep soils, and soils where stones cover more than 3 percent of the surface. Included soils make up about 25 percent of this map unit.

The available water capacity of this Clymer soil is moderate or high. Permeability is moderate or moderately rapid. Runoff is rapid or very rapid, and natural fertility is low. This soil is strongly acid to extremely acid. The depth to bedrock ranges from 42 to 72 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The hazard of erosion is severe in unprotected areas and is a management concern. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has moderately high or high potential for trees, and most areas are wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope and depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper

surface-water disposal will help to control erosion and sedimentation.

The capability unit is VIs.

CwB—Clymer and Wharton rubbly soils, 3 to 15 percent slopes. This unit consists of gently sloping or strongly sloping, well drained and moderately well drained soils on ridgetops and benches on Allegheny Mountain in the western part of Grant County. Stones and boulders cover 15 to 90 percent of the surface of these soils, but they dominantly cover more than 50 percent. The total acreage of this unit is about 50 percent Clymer soils, 25 percent Wharton soils, and 25 percent other soils. Some areas consist entirely of Clymer soils, some entirely of Wharton soils, and some of both. The soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Clymer soils is very dark gray loam about 2 inches thick. The subsurface layer is brown loam about 4 inches thick. The subsoil is about 34 inches thick. The upper 14 inches of the subsoil is yellowish brown loam and channery loam. The lower 20 inches is yellowish brown and strong brown sandy clay loam and channery sandy clay loam. The substratum is yellowish brown channery sandy clay loam to a depth of 60 inches or more.

Typically, the surface layer of the Wharton soils is very dark gray silt loam about 2 inches thick. The subsurface layer is dark brown silt loam about 4 inches thick. The subsoil is 34 inches thick. The upper 11 inches of the subsoil is yellowish brown and strong brown silt loam. The lower 23 inches is strong brown silty clay loam mottled with pinkish gray and yellowish red. The substratum extends to a depth of 60 inches or more. It is strong brown, pinkish gray, and brownish yellow silty clay loam and silt loam.

Included with these soils in mapping are a few areas of Buchanan Variant, Cavode, Dekalb, Gilpin, Hazleton, and Leetonia soils. Also included are a few soils with no stones on the surface, nearly level soils, moderately steep soils, and rock outcrop and rubble land.

The available water capacity of these Clymer and Wharton soils is moderate or high. The permeability of the Clymer soils is moderate or moderately rapid, and the permeability of the Wharton soils is moderately slow or slow. Runoff is medium or rapid, and natural fertility is low. Both soils are strongly acid to extremely acid. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. The depth to bedrock ranges from 42 to 72 inches in the Clymer soils and is more than 40 inches in the Wharton soils.

These soils generally are not suited to cultivated crops or to hay or pasture. They have moderate potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion. The stones and boulders on the surface restrict the use of equipment.

The stones and boulders, moderately slow or slow permeability, seasonal high water table, and slope are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

CwD—Clymer and Wharton rubbly soils, 15 to 35 percent slopes. This unit consists of moderately steep or steep, well drained and moderately well drained soils on benches and hillsides on Allegheny Mountain in the western part of Grant County. Stones and boulders cover 15 to 90 percent of the surface of these soils, but they dominantly cover more than 50 percent. The total acreage of this unit is about 50 percent Clymer soils, 25 percent Wharton soils, and 25 percent other soils. Some areas consist entirely of Clymer soils, some entirely of Wharton soils, and some of both. The soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Clymer soils is very dark gray loam about 2 inches thick. The subsurface layer is brown loam about 3 inches thick. The subsoil is about 35 inches thick. The upper 14 inches of the subsoil is yellowish brown loam and channery loam. The lower 21 inches is yellowish brown and strong brown sandy clay loam and channery sandy clay loam. The substratum is yellowish brown channery sandy clay loam to a depth of 60 inches or more.

Typically, the surface layer of the Wharton soils is very dark gray silt loam about 2 inches thick. The subsurface layer is dark brown silt loam about 3 inches thick. The subsoil is 35 inches thick. The upper 12 inches of the subsoil is yellowish brown and strong brown silt loam. The lower 23 inches is strong brown silty clay loam mottled with pinkish gray and yellowish red. The substratum extends to a depth of 60 inches or more. It is strong brown, pinkish gray, and brownish yellow silty clay loam and silt loam.

Included with these soils in mapping are a few areas of Buchanan Variant, Cavode, Dekalb, Gilpin, Hazleton, and Leetonia soils. Also included are a few small areas of soils with no stones on the surface, strongly sloping soils, very steep soils, and rock outcrop and rubble land.

The available water capacity of these Clymer and Wharton soils is moderate or high. The permeability of the Clymer soils is moderate or moderately rapid, and the permeability of the Wharton soil is moderately slow or slow. Runoff is rapid or very rapid, and natural fertility is low. Both soils are strongly acid to extremely acid. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants.

The depth to bedrock ranges from 42 to 72 inches in the Clymer soils and is more than 40 inches in the Wharton soils.

These soils are not suited to cultivated crops, hay, or pasture. They have moderate potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. The stones and boulders on the surface and the slope restrict the use of equipment.

The stones and boulders, the moderately slow or slow permeability, the seasonal high water table, and the slope are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

DIC—Dekalb, Hazleton and Lehew stony soils, 3 to 15 percent slopes. This unit consists of strongly sloping or gently sloping, well drained soils on ridgetops and benches. Stones cover 1 to 3 percent of the surface of these soils. The total acreage of this unit is about 40 percent Dekalb soils, 25 percent Hazleton soils, 20 percent Lehew soils, and 15 percent other soils. Some areas consist of Dekalb soils, some of Hazleton soils, some of Lehew soils, and some of a combination of the three. The soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Dekalb soils is dark grayish brown and black channery loam about 3 inches thick. The subsurface layer is yellowish brown channery loam about 4 inches thick. The subsoil is yellowish brown channery and very channery loam about 14 inches thick. The substratum is yellowish brown very channery sandy loam that extends to bedrock at a depth of about 25 inches.

Typically, the surface layer of the Hazleton soils is black channery fine sandy loam about 2 inches thick. The subsurface layer is brown channery fine sandy loam about 4 inches thick. The subsoil is yellowish brown and is about 24 inches thick. The upper 5 inches of the subsoil is channery fine sandy loam. The next 11 inches is channery loam. The lower 8 inches is very channery sandy loam. The substratum is yellowish brown very channery loamy sand and sandy loam that extends to bedrock at a depth of about 55 inches.

Typically, the surface layer of the Lehew soils is black channery loam about 2 inches thick. The subsurface layer is brown channery loam about 2 inches thick. The subsoil is yellowish red and reddish brown channery loam 12 inches thick. The substratum is dark reddish brown very channery sandy loam that extends to bedrock at a depth of about 24 inches.

Included with these soils in mapping are areas of Drall, Elliber, Ernest Variant, Murrill, and Schaffenaker soils. Also included are several areas of shallow soils, soils where stones cover more than 3 percent of the surface, soils with no stones on the surface, moderately steep soils, and rock outcrops.

The available water capacity of the Dekalb and Lehew soils is very low or low. The available water capacity of the Hazleton soils is low or moderate. Permeability of the three soils is moderately rapid or rapid. Runoff is medium or rapid, and natural fertility is low. Where unlimed, the Dekalb and Hazleton soils are strongly acid to extremely acid and the Lehew soils are strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Dekalb and Lehew soils. The depth to bedrock in the Hazleton soils is at least 40 inches.

The stones on the surface limit the use of farm machinery and make these soils generally unsuitable for cultivated crops or hay, but the soils are suited to pasture. The hazard of erosion is moderate or severe in unprotected areas and is a management concern. Proper stocking rates and rotation grazing are the main pasture management needs.

These soils have moderate or moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope and depth to bedrock are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

DIE—Dekalb, Hazleton and Lehew stony soils, 15 to 35 percent slopes. This unit consists of steep or moderately steep, well drained soils on benches and hillsides. Stones cover 1 to 3 percent of the surface of these soils. The total acreage of this unit is about 35 percent Dekalb soils, 25 percent Hazleton soils, 25 percent Lehew soils, and 15 percent other soils. Some areas consist of Dekalb soils, some of Hazleton soils, some of Lehew soils, and some of a combination of the three. The soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Dekalb soils is dark grayish brown and black channery loam about 3 inches thick. The subsurface layer is yellowish brown channery loam about 4 inches thick. The subsoil is yellowish brown channery and very channery loam about 14 inches thick. The substratum is yellowish brown very channery sandy loam that extends to bedrock at a depth of about 25 inches.

Typically, the surface layer of the Hazleton soils is black channery fine sandy loam about 2 inches thick. The subsurface layer is brown channery fine sandy loam

about 4 inches thick. The subsoil is yellowish brown and is about 26 inches thick. The upper 5 inches of the subsoil is channery fine sandy loam. The next 13 inches is channery loam. The lower 8 inches is very channery sandy loam. The substratum is yellowish brown very channery loamy sand and sandy loam that extends to bedrock at a depth of about 55 inches.

Typically, the surface layer of the Lehew soils is black channery loam about 2 inches thick. The subsurface layer is brown channery loam about 2 inches thick. The subsoil is yellowish red and reddish brown channery loam 14 inches thick. The substratum is dark reddish brown very channery sandy loam that extends to bedrock at a depth of about 27 inches.

Included with these soils in mapping are areas of Drall, Elliber, Laidig, Murrill, and Schaffenaker soils. Also included are a few areas of soils where stones cover more than 3 percent of the soil, shallow soils, soils with no stones on the surface, steep soils, and rock outcrops.

The available water capacity of the Dekalb and Lehew soils is very low or low. The available water capacity of the Hazleton soils is low or moderate. Permeability of the three soils is moderately rapid or rapid. Runoff is rapid or very rapid, and natural fertility is low. Where unlimed, the Dekalb and Hazleton soils are strongly acid to extremely acid and the Lehew soils are strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Dekalb and Lehew soils. The depth to bedrock in the Hazleton soils is at least 40 inches.

Slope and the stones on the surface restrict the use of machinery and make these soils generally unsuited to cultivated crops or hay and difficult to manage for pasture. These soils have low to moderately high potential productivity for trees, and most of the areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope and depth to bedrock are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

DIF—Dekalb, Hazleton and Lehew stony soils, 35 to 65 percent slopes. This unit consists of very steep, well drained soils on hillsides. Stones cover 1 to 3 percent of the surface of these soils. The total acreage of this unit is about 35 percent Dekalb soils, 25 percent Hazleton soils, 20 percent Lehew soils, and 20 percent other soils. Some areas consist of Dekalb soils, some of Hazleton soils, some of Lehew soils, and some of a combination of the three. The soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Dekalb soils is dark grayish brown and black channery loam about 2 inches thick. The subsurface layer is yellowish brown channery loam about 4 inches thick. The subsoil is yellowish brown channery and very channery loam about 18 inches thick. The substratum is yellowish brown very channery sandy loam that extends to bedrock at a depth of about 32 inches.

Typically, the surface layer of the Hazleton soils is black channery fine sandy loam about 3 inches thick. The subsurface layer is brown channery fine sandy loam about 4 inches thick. The subsoil is yellowish brown and is about 28 inches thick. The upper 6 inches of the subsoil is channery fine sandy loam. The next 13 inches is channery loam. The lower 9 inches is very channery sandy loam. The substratum is yellowish brown very channery loamy sand and sandy loam that extends to bedrock at a depth of about 55 inches.

Typically, the surface layer of the Lehew soils is black channery loam about 2 inches thick. The subsurface layer is brown channery loam about 2 inches thick. The subsoil is yellowish red and reddish brown channery loam 18 inches thick. The substratum is dark reddish brown very channery sandy loam that extends to bedrock at a depth of about 32 inches.

Included with these soils in mapping are areas of Drall, Elliber, Laidig, Murrill, and Schaffenaker soils. Also included are areas of shallow soils, soils where stones cover more than 3 percent of the surface, steep soils, and rock outcrops. Inclusions make up about 15 percent of this map unit.

The available water capacity of the Dekalb and Lehew soils is very low or low. The available water capacity of the Hazleton soils is low or moderate. Permeability of the three soils is moderately rapid or rapid. Runoff is very rapid, and natural fertility is low. Where unlimed, the Dekalb and Hazleton soils are strongly acid to extremely acid and the Lehew soils are strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Dekalb and Lehew soils. The depth to bedrock in the Hazleton soils is at least 40 inches.

The stones on the surface limit the use of farm machinery and make these soils generally unsuitable for cultivated crops or hay, but the soils are suited to pasture. The hazard of erosion is moderate or severe in unprotected areas and is a management concern. Proper stocking rates and rotation grazing are the main pasture management needs.

The slope and depth to bedrock are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

DsC—Dekalb, Hazleton and Lehew very stony soils, 3 to 15 percent slopes. This unit consists of strongly sloping or gently sloping, well drained soils on ridgetops and benches. Stones cover 3 to 15 percent of the surface of these soils. The total acreage of this unit is about 40 percent Dekalb soils, 25 percent Hazleton soils, 20 percent Lehew soils, and 15 percent other soils. Some areas consist of Dekalb soils, some of Hazleton soils, some of Lehew soils, and some of a combination of the three. The soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Dekalb soils is dark grayish brown and black channery loam about 3 inches thick. The subsurface layer is yellowish brown channery loam about 4 inches thick. The subsoil is yellowish brown channery and very channery loam about 14 inches thick. The substratum is yellowish brown very channery sandy loam that extends to bedrock at a depth of about 25 inches.

Typically, the surface layer of the Hazleton soils is black channery fine sandy loam about 2 inches thick. The subsurface layer is brown channery fine sandy loam about 4 inches thick. The subsoil is yellowish brown and is about 24 inches thick. The upper 5 inches of the subsoil is channery fine sandy loam. The next 11 inches is channery loam. The lower 8 inches is very channery sandy loam. The substratum is yellowish brown very channery loamy sand and sandy loam that extends to bedrock at a depth of about 55 inches.

Typically, the surface layer of the Lehew soils is black channery loam about 2 inches thick. The subsurface layer is brown channery loam about 2 inches thick. The subsoil is yellowish red and reddish brown channery loam 12 inches thick. The substratum is dark reddish brown very channery sandy loam that extends to bedrock at a depth of about 24 inches.

Included with these soils in mapping are areas of Drall, Elliber, Murrill, and Schaffenaker soils. Also included are areas of shallow soils, soils where stones cover 1 to 3 percent of the surface, moderately steep soils, and rock outcrop and rubble land.

The available water capacity of the Dekalb and Lehew soils is very low or low. The available water capacity of the Hazleton soils is low or moderate. Permeability of the three soils is moderately rapid or rapid. Runoff is medium or rapid, and natural fertility is low. Where unlimed, the Dekalb and Hazleton soils are strongly acid to extremely acid and the Lehew soils are strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Dekalb and Lehew soils. The depth to bedrock in the Hazleton soils is at least 40 inches.

The stones on the surface restrict the use of farm machinery and make these soils generally unsuited to cultivated crops or hay and difficult to manage for pasture. These soils have moderate or moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. The stones on the surface restrict the use of equipment.

The stones, slope, and depth to bedrock are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

DsE—Dekalb, Hazleton and Lehew very stony soils, 15 to 35 percent slopes. This unit consists of steep or moderately steep, well drained soils on benches and hillsides. Stones cover 3 to 15 percent of the surface of these soils. The total acreage of this unit is about 35 percent Dekalb soils, 25 percent Hazleton soils, 20 percent Lehew soils, and 20 percent other soils. Some areas consist of Dekalb soils, some of Hazleton soils, some of Lehew soils, and some of a combination of the three. The soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Dekalb soils is dark grayish brown and black channery loam about 3 inches thick. The subsurface layer is yellowish brown channery loam about 4 inches thick. The subsoil is yellowish brown channery and very channery loam about 14 inches thick. The substratum is yellowish brown very channery sandy loam that extends to bedrock at a depth of about 28 inches.

Typically, the surface layer of the Hazleton soils is black channery fine sandy loam about 2 inches thick. The subsurface layer is brown channery fine sandy loam about 4 inches thick. The subsoil is yellowish brown and is about 26 inches thick. The upper 5 inches of the subsoil is channery fine sandy loam. The next 11 inches is channery loam. The lower 10 inches is very channery sandy loam. The substratum is yellowish brown very channery loamy sand and sandy loam that extends to bedrock at a depth of about 55 inches.

Typically, the surface layer of the Lehew soils is black channery loam about 2 inches thick. The subsurface layer is brown channery loam about 2 inches thick. The subsoil is yellowish red and reddish brown channery loam 14 inches thick. The substratum is dark reddish brown very channery sandy loam that extends to bedrock at a depth of about 24 inches.

Included with these soils in mapping are areas of Drall, Elliber, Laidig, Murrill, and Schaffenaker soils. Also included are areas of shallow soils, soils where stones cover 1 to 3 percent of the surface, very steep soils, and rock outcrop and rubble land.

The available water capacity of the Dekalb and Lehew soils is very low or low. The available water capacity of the Hazleton soils is low or moderate. Permeability of the three soils is moderately rapid or rapid. Runoff is rapid or

very rapid, and natural fertility is low. Where unlimed, the Dekalb and Hazleton soils are strongly acid to extremely acid and the Lehew soils are strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Dekalb and Lehew soils. The depth to bedrock in the Hazleton soils is at least 40 inches.

Slope and the stones on the surface restrict the use of machinery and make these soils generally unsuited to cultivated crops, hay, or pasture. The soils have low to moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope, stones, and depth to bedrock are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

DsF—Dekalb, Hazleton and Lehew very stony soils, 35 to 65 percent slopes. This unit consists of very steep, well drained soils on hillsides. Stones cover 3 to 15 percent of the surface of these soils. The total acreage of this unit is about 35 percent Dekalb soils, 25 percent Hazleton soils, 20 percent Lehew soils, and 20 percent other soils. Some areas consist of Dekalb soils, some of Hazleton soils, some of Lehew soils, and some of a combination of the three. The soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Dekalb soils is dark grayish brown and black channery loam about 2 inches thick. The subsurface layer is yellowish brown channery loam about 4 inches thick. The subsoil is yellowish brown channery and very channery loam about 18 inches thick. The substratum is yellowish brown very channery sandy loam that extends to bedrock at a depth of about 32 inches.

Typically, the surface layer of the Hazleton soils is black channery fine sandy loam about 2 inches thick. The subsurface layer is brown channery fine sandy loam about 4 inches thick. The subsoil is yellowish brown and is about 28 inches thick. The upper 6 inches of the subsoil is channery fine sandy loam. The next 13 inches is channery loam. The lower 9 inches is very channery sandy loam. The substratum is yellowish brown very channery loamy sand and sandy loam that extends to bedrock at a depth of about 55 inches.

Typically, the surface layer of the Lehew soils is black channery loam about 2 inches thick. The subsurface layer is brown channery loam about 2 inches thick. The subsoil is yellowish red and reddish brown channery loam 18 inches thick. The substratum is dark reddish brown very channery sandy loam that extends to bedrock at a depth of about 32 inches.

Included with these soils in mapping are Drall, Elliber, Laidig, Murrill, and Schaffenaker soils. Also included are areas of shallow soils, soils where stones cover 1 to 3 percent of the surface, steep soils, and rock outcrop and rubble land.

The available water capacity of the Dekalb and Lehew soils is very low or low. The available water capacity of the Hazleton soils is low or moderate. Permeability of the three soils is moderately rapid or rapid. Runoff is medium or rapid, and natural fertility is low. Where unlimed, the Dekalb and Hazleton soils are strongly acid to extremely acid and the Lehew soils are strongly acid or very strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Dekalb and Lehew soils. The depth to bedrock in the Hazleton soils is at least 40 inches.

Slope and the stones on the surface make these soils generally unsuited to cultivated crops, hay, or pasture. These soils have low to moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. The slope and stones on the surface restrict the use of equipment.

The slope, stones, and depth to bedrock are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

Du—Dunning silty clay loam. This soil is nearly level and very poorly drained to poorly drained. It is on flood plains in Hardy County and in the eastern and central parts of Grant County. Slopes range from 0 to 3 percent.

Typically, the surface layer is very dark gray silty clay loam about 6 inches thick over black silty clay loam 16 inches thick. The subsoil is about 23 inches thick. It is gray silty clay mottled with strong brown. The substratum extends to a depth of 60 inches or more. It is dark gray silty clay mottled with strong brown.

Included with this soil in mapping are a few areas of Melvin soil, soils that do not have a thick, dark surface layer, and soils in which the depth to bedrock is less than 60 inches. Also included are a few soils that are not flooded and soils with gravelly layers within 40 inches of the surface. Included soils make up about 20 percent of this map unit.

The available water capacity of this Dunning soil is high. Permeability is slow. Runoff is slow, and natural fertility is high. This soil is medium acid to mildly alkaline. A seasonal high water table at or near the surface restricts the root growth of plants. The depth to bedrock is more than 60 inches.

If adequately drained, this soil is suited to cultivated crops and to hay and pasture, especially water-tolerant grasses and legumes. Draining the soil is difficult, however, because of the clayey subsoil. If the soil is cultivated, conservation tillage, cultivating on the contour, using hay in the crop sequence, delaying tillage until the soil is dry, and using crop residue on and in the soil will help to maintain fertility and tilth. Proper stocking rates, rotation grazing, and deferred grazing until the soil is firm are the main pasture management needs.

This soil has very high potential productivity for trees that tolerate wetness. The use of equipment is restricted during wet seasons because the soil is soft.

A hazard of flooding, the seasonal high water table, and the slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control stream scouring and sedimentation.

The capability subclass is IIIw.

EaC—Edom silt loam, 8 to 15 percent slopes. This soil is strongly sloping and well drained. It is mostly on ridgetops and benches.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsoil is about 29 inches thick. In sequence downward, it is 4 inches of strong brown silt loam, 7 inches of yellowish red silty clay loam, 12 inches of red and dark brown silty clay, and 6 inches of mixed dark brown, red, and reddish brown silty clay loam. The substratum is dark grayish brown and yellowish red shaly silty clay loam that extends to bedrock at a depth of about 42 inches.

Included with this soil in mapping are a few areas of Berks soils, severely eroded soils, moderately well drained to poorly drained soils, and moderately deep soils. Also included are several areas of gently sloping soils and a few areas of moderately steep soils. Included soils make up about 20 percent of this map unit.

The available water capacity of this Edom soil is moderate or high. Permeability is moderately slow or moderate. Runoff is rapid, and natural fertility is high. This soil is strongly acid to neutral in the surface layer and upper part of the subsoil and medium acid to mildly alkaline in the lower part of the subsoil and in the substratum. The depth to bedrock ranges from 40 to 60 inches.

This soil is suited to cultivated crops and to hay or pasture. It is used mainly for hay and pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope, low strength, and the depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

EaD—Edom silt loam, 15 to 25 percent slopes. This soil is moderately steep and well drained. It is on benches and hillsides which are commonly dissected by drainageways.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsoil is about 25 inches thick. In sequence downward, it is 3 inches of strong brown silt loam, 5 inches of yellowish red silty clay loam, 12 inches of red and dark brown silty clay, and 5 inches of mixed dark brown, red, and reddish brown silty clay loam. The substratum is dark grayish brown and yellowish red shaly silty clay loam that extends to bedrock at a depth of about 41 inches.

Included with this soil in mapping are a few areas of Berks soils, severely eroded soils, and moderately deep soils. Also included are a few gently sloping soils and a few moderately steep soils. Included soils make up about 30 percent of this map unit.

The available water capacity of this Edom soil is moderate or high. Permeability is moderately slow or moderate. Runoff is rapid, and natural fertility is high. This soil is strongly acid to neutral in the surface layer and upper part of the subsoil and medium acid to mildly alkaline in the lower part of the subsoil and in the substratum. The depth to bedrock ranges from 40 to 60 inches.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture. It is used mainly for pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, but most areas have been cleared. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope, low strength, and the depth to bedrock are the main limitations of this soil for most urban uses.

Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IVe.

EaE3—Edom silt loam, 25 to 35 percent slopes, severely eroded. This soil is steep and well drained. It is on hillsides which are commonly dissected by drainageways. Erosion has removed most of the original surface layer of the soil, and the subsoil is exposed in places.

Typically, the surface layer is dark grayish brown silt loam about 1 inch thick. The subsoil is about 23 inches thick. In sequence downward, it is 3 inches of strong brown silt loam, 5 inches of yellowish red silty clay loam, 11 inches of red and dark brown silty clay, and 7 inches of mixed dark brown, red, and reddish brown silty clay loam. The substratum is dark grayish brown and yellowish red shaly silty clay loam that extends to bedrock at a depth of about 40 inches.

Included with this soil in mapping are a few areas of Berks and Opequon soils, gullied soils, and moderately deep soils. Also included are a few moderately steep soils and a few very steep soils. Included soils make up about 30 percent of this map unit.

The available water capacity of this Edom soil is moderate or high. Permeability is moderately slow or moderate. Runoff is very rapid, and natural fertility is high. This soil is strongly acid to neutral in the surface layer and upper part of the subsoil and medium acid to mildly alkaline in the lower part of the subsoil and in the substratum. The depth to bedrock ranges from 40 to 60 inches.

This soil is not suited to cultivated crops or hay and is difficult to manage for pasture. The hazard of further erosion is very severe in unprotected areas. Overgrazing of pasture is a major management concern. Proper stocking rates, rotation grazing, and a permanent plant cover are the major pasture management needs.

This soil has moderately high potential productivity for trees, and most of it is wooded or reverting to woody species. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope, low strength, and the depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water control will help to control erosion and sedimentation.

The capability subclass is VIIe.

EcC—Edom channery silt loam, 8 to 15 percent slopes. This soil is strongly sloping and well drained. It is mostly on ridgetops and benches.

Typically, the surface layer is dark grayish brown channery loam about 4 inches thick. The subsoil is about 37 inches thick. The upper 4 inches of the subsoil is light yellowish brown shaly silt loam. The next 7 inches is strong brown shaly silty clay. The lower 26 inches is yellowish red shaly silty clay. The substratum is yellowish red very shaly silty clay that extends to bedrock at a depth of about 50 inches.

Included with this soil in mapping are several areas of less clayey soils, gently sloping soils, severely eroded soils, moderately deep soils, and soils that have more rock fragments in the subsoil than this Edom soil has. A few stony soils and rock outcrops are also included in mapping. Inclusions make up about 35 percent of this map unit.

The available water capacity of this Edom soil is moderate or high. Permeability is moderately slow or moderate. Runoff is rapid, and natural fertility is high. This soil is strongly acid to neutral in the surface layer and upper part of the subsoil and medium acid to mildly alkaline in the lower part of the subsoil and in the substratum. The depth to bedrock ranges from 40 to 60 inches.

This soil is suited to cultivated crops and to hay or pasture. It is used mainly for hay and pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, but most areas have been cleared. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope, low strength, and the depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

EcD—Edom channery silt loam, 15 to 25 percent slopes. This soil is moderately steep and well drained. It is mainly on benches.

Typically, the surface layer is dark grayish brown channery loam about 3 inches thick. The subsoil is about 41 inches thick. The upper 3 inches of the subsoil is light yellowish brown shaly silt loam. The next 9 inches is strong brown shaly silty clay. The lower 29 inches is yellowish red shaly silty clay. The substratum is yellowish red very shaly silty clay that extends to bedrock at a depth of about 52 inches.

Included with this soil in mapping are several areas of less clayey soils, strongly sloping soils, steep soils, severely eroded soils, moderately deep soils, and soils that have more rock fragments in the subsoil than this Edom soil has. A few stony soils and rock outcrops are also included in mapping. Inclusions make up about 30 percent of this map unit.

The available water capacity of this Edom soil is moderate or high. Permeability is moderately slow or moderate. Runoff is rapid, and natural fertility is high. This soil is strongly acid to neutral in the surface layer and upper part of the subsoil and medium acid to mildly alkaline in the lower part of the subsoil and in the substratum. The depth to bedrock ranges from 40 to 60 inches.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, and it is mostly wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope, low strength, and the depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IVe.

EcE—Edom channery silt loam, 25 to 35 percent slopes. This soil is steep and well drained. It is on hillsides which are commonly dissected by drainageways.

Typically, the surface layer is dark grayish brown channery loam about 3 inches thick. The subsoil is about 38 inches thick. The upper 3 inches of the subsoil is light yellowish brown shaly silt loam. The next 6 inches is strong brown shaly silty clay. The lower 29 inches is yellowish red shaly silty clay. The substratum is yellowish red very shaly silty clay that extends to bedrock at a depth of about 54 inches.

Included with this soil in mapping are several areas of less clayey soils, moderately steep soils, very steep soils, severely eroded soils, soils that have more rock fragments in the subsoil than this Edom soil has, and moderately deep soils. A few stony soils and rock outcrops are also included in mapping. Inclusions make up about 30 percent of this map unit.

The available water capacity of this Edom soil is moderate or high. Permeability is moderately slow or moderate. Runoff is very rapid, and natural fertility is high. This soil is strongly acid to neutral in the surface layer and upper part of the subsoil and medium acid to mildly alkaline in the lower part of the subsoil and in the substratum. The depth to bedrock ranges from 40 to 60 inches.

This soil generally is not suited to cultivated crops or hay, but it is suited to pasture. The hazard of erosion is very severe in unprotected areas. Overgrazing of pasture is a major management concern. Proper stocking rates, rotation grazing, and establishing a permanent plant cover are the major pasture management needs.

This soil has moderately high potential productivity for trees, and most of it is wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope, low strength, and the depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIe.

EcF—Edom channery silt loam, 35 to 65 percent slopes. This soil is very steep and well drained. It is on hillsides which are commonly dissected by drainageways.

Typically, the surface layer is dark grayish brown channery loam about 3 inches thick. The subsoil is about 38 inches thick. The upper 3 inches of the subsoil is light yellowish brown shaly silt loam. The next 6 inches is strong brown shaly silty clay. The lower 29 inches is yellowish red shaly silty clay. The substratum is yellowish red very shaly silty clay that extends to bedrock at a depth of about 54 inches.

Included with this soil in mapping are several areas of less clayey soils, steep soils, severely eroded soils, and moderately deep soils. Also included are a few soils where stones cover 1 to 3 percent of the surface, soils that have more rock fragments in the subsoil than this Edom soil has, and a few rock outcrops. Inclusions make up about 35 percent of this map unit.

The available water capacity of this Edom soil is moderate or high. Permeability is moderately slow or moderate. Runoff is very rapid, and natural fertility is high. This soil is strongly acid to neutral in the surface layer and upper part of the subsoil and medium acid to mildly alkaline in the lower part of the subsoil and in the substratum. The depth to bedrock ranges from 40 to 60 inches.

This soil is not suited to cultivated crops or hay and is difficult to manage for pasture. The hazard of erosion is very severe in unprotected areas.

This soil has moderately high potential productivity for trees, and most of it is wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope, low strength, and the depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIe.

EIC—Elliber very cherty loam, 8 to 15 percent slopes. This soil is strongly sloping and well drained. It is on ridgetops and benches.

Typically, the surface layer is black very cherty loam about 3 inches thick. The subsurface layer is pale brown very cherty loam about 9 inches thick. The subsoil is 34 inches thick. The upper 13 inches of the subsoil is pale brown and light yellowish brown very cherty loam and very cherty sandy loam. The lower 21 inches is brownish yellow very cherty loam. The substratum is brownish yellow very cherty loam to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of Dekalb and Opequon soils. Also included are small areas of stony soils, gently sloping soils, and moderately steep soils. Included soils make up about 25 percent of this map unit.

The available water capacity of this Elliber soil is very low to moderate. Permeability is moderately rapid. Runoff is rapid, and natural fertility is medium. Where unlimed, the soil is extremely acid to strongly acid.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture or to apple orchards. The chert in the soil hinders tillage. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour helps to control this erosion.

Slope is the main limitation of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IVs.

EID—Elliber very cherty loam, 15 to 25 percent slopes. This soil is moderately steep and well drained. It is on benches and hillsides.

Typically, the surface layer is black very cherty loam about 3 inches thick. The subsurface layer is pale brown very cherty loam about 10 inches thick. The subsoil is about 31 inches thick. The upper 10 inches of the subsoil is pale brown and light yellowish brown very cherty loam and very cherty sandy loam. The lower 21 inches is brownish yellow very cherty loam. The substratum is brownish yellow very cherty loam to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of Dekalb and Opequon soils. Also included are small areas of soils where stones cover 1 to 3 percent of the surface, strongly sloping soils, steep soils, and soils that contain sandstone rock fragments. Included soils make up about 25 percent of the map unit.

The available water capacity of this Elliber soil is very low to moderate. Permeability is moderately rapid. Runoff is rapid, and natural fertility is medium. Where unlimed, the soil is extremely acid to strongly acid.

This soil is not suited to cultivated crops or hay, but it is suited to pasture and apple orchards. The chert in the soil hinders tillage. The hazard of erosion is severe in unprotected areas and is a management concern. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has high or very high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

Slope is the main limitation of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

EIE—Elliber very cherty loam, 25 to 35 percent slopes. This soil is steep and well drained. It is on hillsides.

Typically, the surface layer is black very cherty loam about 4 inches thick. The subsurface layer is pale brown very cherty loam about 12 inches thick. The subsoil is about 29 inches thick. The upper 13 inches of the subsoil is pale brown and light yellowish brown very cherty loam and very cherty sandy loam. The lower 16 inches is brownish yellow very cherty loam. The substratum is brownish yellow very cherty loam to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of Dekalb and Opequon soils. Also included are small areas of soils where stones cover 1 to 3 percent of the surface, moderately steep soils, very steep soils, and soils that contain sandstone rock fragments. A few rock outcrops are in some areas. Inclusions make up about 25 percent of the map unit.

The available water capacity of this Elliber soil is very low to moderate. Permeability is moderately rapid. Runoff is very rapid, and natural fertility is medium. This soil is extremely acid to strongly acid.

This soil generally is not suited to cultivated crops or hay and is difficult to manage for pasture. The soil has high or very high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

Slope is the main limitation of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

ElF—Elliber very cherty loam, 35 to 65 percent slopes. This soil is very steep and well drained. It is on hillsides.

Typically, the surface layer is black very cherty loam about 4 inches thick. The subsurface layer is pale brown very cherty loam about 12 inches thick. The subsoil is about 29 inches thick. The upper 13 inches of the subsoil is pale brown to light yellowish brown very cherty loam and very cherty sandy loam. The lower 16 inches is brownish yellow very cherty loam. The substratum is brownish yellow very cherty loam to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of Dekalb and Opequon soils. Also included are small areas of stony soils, steep soils, and soils that contain sandstone rock fragments. A few rock outcrops are in some areas. Inclusions make up about 25 percent of the map unit.

The available water capacity of this Elliber soil is very low to moderate. Permeability is moderately rapid. Runoff is very rapid, and natural fertility is medium. This soil is extremely acid to strongly acid.

This soil generally is not suited to cultivated crops or hay and is difficult to manage for pasture. The soil has high or very high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

Slope is the main limitation of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

EmE—Elliber stony loam, 15 to 35 percent slopes. This soil is steep or moderately steep and is well drained. It is on benches and hillsides. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is black very cherty loam about 2 inches thick. The subsurface layer is pale brown very cherty loam about 8 inches thick. The subsoil is about 33 inches thick. The upper 15 inches of the subsoil is pale brown and light yellowish brown very cherty loam and very cherty sandy loam. The lower 18 inches of the subsoil is brownish yellow very cherty loam. The substratum is brownish yellow very cherty loam to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of Dekalb and Opequon soils. Also included are small areas of soils where stones cover more than 3 percent of the surface, soils with no stones on the surface, strongly sloping soils, very steep soils, and soils that contain sandstone rock fragments. A few rock outcrops are in some areas. Inclusions make up about 25 percent of the map unit.

The available water capacity of this Elliber soil is very low to moderate. Permeability is moderately rapid. Runoff is rapid or very rapid, and natural fertility is medium. This soil is extremely acid to strongly acid.

The stones on the surface restrict the use of farm machinery and make this soil generally unsuited to cultivated crops or hay and difficult to manage for pasture. This soil has high or very high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

Slope is the main limitation of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

EmF—Elliber stony loam, 35 to 65 percent slopes. This soil is very steep and well drained. It is on hillsides. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is black very cherty loam about 1 inch thick. The subsurface layer is pale brown very cherty loam about 8 inches thick. The subsoil is about 34 inches thick. The upper 16 inches of the subsoil is pale brown and light yellowish brown very cherty loam and very cherty sandy loam. The lower 18 inches is brownish yellow very cherty loam. The substratum is brownish yellow very cherty loam to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of Dekalb and Opequon soils. Also included are small areas of steep soils, soils where stones cover more than 3 percent of the surface, soils with no stones on the surface, and soils that contain sandstone rock

fragments. A few rock outcrops are in some areas. Inclusions make up about 25 percent of the map unit.

The available water capacity of this Elliber soil is very low to moderate. Permeability is moderately rapid. Runoff is very rapid, and natural fertility is medium. This soil is extremely acid to strongly acid.

This soil is not suited to cultivated crops, hay, or pasture. It has high or very high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

Slope is the main limitation of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

ErB—Ernest silt loam, 3 to 8 percent slopes. This soil is gently sloping and moderately well drained. It is on foot slopes, in coves, and along drainageways.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is yellowish brown and is about 29 inches thick. The upper 7 inches of the subsoil is silt loam. The next 9 inches is silty clay loam mottled with brownish gray and strong brown. The lower 13 inches is very firm and brittle silty clay loam mottled with brownish gray, yellowish red, and black. The substratum extends to a depth of 60 inches or more. It is strong brown, pinkish gray, yellowish brown, yellowish red, light brownish gray, and black silty clay loam.

Included with this soil in mapping are a few areas of Berks and Monongahela soils, poorly drained soils, soils with stones on the surface, and soils with a reddish brown subsoil. Also included are a few areas of nearly level soils, strongly sloping soils, and soils in which the firm part of the subsoil is at a depth of more than 40 inches or in which the subsoil is friable throughout. Also included are a few areas of well drained soils and soils with a very shaly or gravelly subsoil and substratum. Included soils make up about 35 percent of this map unit.

The available water capacity of this Ernest soil is moderate. Permeability is moderate above the firm part of the subsoil and slow or moderately slow in the firm part. Runoff is medium, and natural fertility is low. Where unlimed, this soil is strongly acid or very strongly acid. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. The depth to bedrock is generally more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture, but some small wet areas need drainage. The soil is used mainly for cultivated crops and hay. The hazard of erosion is moderate in cultivated areas and is a management concern. If this soil is cultivated, cultivating on the contour, using hay in the crop squence, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, and some areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because the soil is soft.

The seasonal high water table, low strength, and the slow or moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIe.

ErC—Ernest silt loam, 8 to 15 percent slopes. This soil is strongly sloping and moderately well drained. It is on foot slopes, in coves, and along drainageways.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is yellowish brown and is about 31 inches thick. The upper 8 inches of the subsoil is silt loam. The next 10 inches is silty clay loam mottled with brownish gray and strong brown. The lower 13 inches is very firm and brittle silty clay loam mottled with brownish gray, yellowish red, and black. The substratum extends to a depth of 60 inches or more. It is strong brown, pinkish gray, yellowish brown, yellowish red, light brownish gray, and black silty clay loam.

Included with this soil in mapping are a few small areas of Berks and Monongahela soils, poorly drained soils, soils with stones on the surface, and soils with a reddish brown subsoil. Also included are a few areas of gently sloping soils, moderately steep soils, and soils in which the firm part of the subsoil is below a depth of 40 inches or in which the subsoil is friable throughout. Also included are a few areas of well drained soils and a few soils with a very shaly or gravelly subsoil and substratum. Included soils make up about 35 percent of this map unit.

The available water capacity of this Ernest soil is moderate. Permeability is moderate above the firm part of the subsoil and slow or moderately slow in the firm part. Runoff is rapid, and natural fertility is low. Where unlimed, this soil is strongly acid or very strongly acid. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. The depth to bedrock is generally more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for hay and pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated,

conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, and several areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because the soil is soft.

The seasonal high water table, low strength, the slope, and the moderately slow or slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

ErD—Ernest silt loam, 15 to 25 percent slopes. This soil is moderately steep and moderately well drained. It is on foot slopes, in coves, and along drainageways.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is yellowish brown and is about 32 inches thick. The upper 8 inches of the subsoil is silt loam. The next 11 inches is silty clay loam mottled with brownish gray and strong brown. The lower 13 inches is very firm and brittle silty clay loam mottled with brownish gray, yellowish red, and black. The substratum extends to a depth of 60 inches or more. It is strong brown, pinkish gray, yellowish brown, yellowish red, light brownish gray, and black silty clay loam.

Included with this soil in mapping are a few areas of Berks soil and several areas of soils that are redder in the subsoil than this Ernest soil. Also included are a few areas of strongly sloping soils, soils in which the firm part of the subsoil is below a depth of 40 inches or in which the subsoil is friable throughout, and well drained soils. Included soils make up about 25 percent of this map unit.

The available water capacity of this Ernest soil is moderate. Permeability is moderate above the firm part of the subsoil and slow or moderately slow in the firm part. Runoff is rapid, and natural fertility is low. Where unlimed, this soil is strongly acid or very strongly acid. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. The depth to bedrock is generally more than 60 inches.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, and slightly more than half of the acreage is wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment, and its use is restricted during wet seasons because the soil is soft.

The seasonal high water table, low strength, the slope, and the moderately slow or slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IVe.

EvC—Ernest Variant stony loam, 3 to 15 percent slopes. This soil is strongly sloping or gently sloping and is moderately well drained. It is on foot slopes and benches. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is yellowish brown channery loam about 3 inches thick. The subsoil is about 41 inches thick. The upper 11 inches of the subsoil is yellowish brown channery loam and channery silt loam. The next 15 inches is strong brown channery silty clay loam mottled in the lower part with gray and yellowish red. The lower 15 inches is strong brown silty clay mottled with yellowish red and gray. The substratum is strong brown and gray very shaly silty clay loam that extends to bedrock at a depth of about 52 inches.

Included with this soil in mapping are a few areas of Buchanan, Ernest, Laidig, and Murrill soils. Also included are a few areas of soils that are redder than this Ernest Variant soil, soils with no stones on the surface, and soils with more sand in the surface layer and upper part of the subsoil than this Ernest Variant soil has. Included soils make up about 30 percent of this map unit.

The available water capacity of this Ernest Variant soil is moderate or high. Permeability is moderate or moderately rapid in the surface layer and upper part of the subsoil and moderately slow or moderate in the lower part of the subsoil. Runoff is medium or rapid, and natural fertility is low. Where unlimed, this soil is strongly acid or very strongly acid. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. The depth to bedrock is more than 48 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The hazard of erosion is moderate or severe in

unprotected areas and is a management concern. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are the main pasture management needs.

This soil has high potential productivity for trees, and about half the acreage is wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because the soil is soft.

The slope, the seasonal high water table, low strength, and the moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

EvD—Ernest Variant stony loam, 15 to 25 percent slopes. This soil is moderately steep and moderately well drained. It is on foot slopes and benches. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark grayish brown channery loam about 2 inches thick. The subsurface layer is yellowish brown channery loam about 2 inches thick. The subsoil is about 41 inches thick. The upper 13 inches of the subsoil is yellowish brown channery loam and channery silt loam. The next 13 inches is strong brown channery silty clay loam mottled in the lower part with gray and yellowish red. The lower 15 inches is strong brown silty clay mottled with yellowish red and gray. The substratum is strong brown and gray very shaly silty clay loam that extends to bedrock at a depth of about 51 inches.

Included with this soil in mapping are a few areas of Buchanan, Ernest, Laidig, and Murrill soils. Also included are a few areas of soils that are redder than this Ernest Variant soil, steep soils, and soils with more sand in the surface layer and upper part of the subsoil than this Ernest Variant soil has. Included soils make up about 30 percent of this map unit.

The available water capacity of this Ernest Variant soil is moderate or high. Permeability is moderate or moderately rapid in the surface layer and upper part of the subsoil and moderately slow or moderate in the lower part of the subsoil. Runoff is rapid, and natural fertility is low. Where unlimed, this soil is strongly acid or very strongly acid. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. The depth to bedrock is more than 48 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The hazard of erosion is moderate or severe in unprotected areas and is a management concern. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are the main pasture management needs.

This soil has high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment, and its use is restricted during wet seasons because this soil is soft.

The slope, the seasonal high water table, low strength, and the moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

GlB—Gilpin silt loam, 3 to 8 percent slopes. This soil is gently sloping and well drained. It is mostly on broad ridgetops on Allegheny Mountain in the western part of Grant County.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is strong brown channery silt loam about 24 inches thick. The substratum is strong brown very channery silty clay loam that extends to bedrock at a depth of about 36 inches.

Included with this soil in mapping are a few small areas of Clymer, Dekalb, and Wharton soils. Also included are a few small areas of nearly level soils, strongly sloping soils, and medium-acid soils. Included soils make up about 20 percent of this map unit.

The available water capacity of this Gilpin soil is low or moderate. Permeability is moderate. Runoff is medium, and natural fertility is low or medium. Where unlimed, this soil is strongly acid to extremely acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for pasture and hay. The hazard of erosion is moderate in cultivated areas and is a management concern. If this soil is cultivated, cultivating on the contour, using hay in the crop sequence, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has high potential productivity for trees, and some areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The depth to bedrock is the main limitation of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIe.

GlC—Gilpin silt loam, 8 to 15 percent slopes. This soil is strongly sloping and well drained. It is on ridgetops and benches on Allegheny Mountain in the western part of Grant County.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is strong brown channery silt loam about 24 inches thick. The substratum is strong brown very channery silty clay loam that extends to bedrock at a depth of about 37 inches.

Included with this soil in mapping are small areas of Clymer, Dekalb, and Wharton soils. Also included are a few small areas of gently sloping soils, moderately steep soils, soils with stones on the surface, and medium-acid soils. Included soils make up about 20 percent of this map unit.

The available water capacity of this Gilpin soil is low or moderate. Permeability is moderate. Runoff is rapid, and natural fertility is low or medium. Where unlimed, this soil is strongly acid to extremely acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for hay and pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has high potential productivity for trees, and a few areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope and depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

GlD—Gilpin silt loam, 15 to 25 percent slopes. This soil is moderately steep and well drained. It is on ridgetops and benches mainly on Allegheny Mountain in the western part of Grant County.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is strong brown channery silt loam about 24 inches thick. The substratum is strong brown very channery silty clay loam that extends to bedrock at a depth of about 37 inches.

Included with this soil in mapping are a few small areas of Clymer and Wharton soils. Also included are a few small areas of strongly sloping soils, steep soils, and soils with stones on the surface. Included soils make up about 20 percent of this map unit.

The available water capacity of this Gilpin soil is low or moderate. Permeability is moderate. Runoff is rapid, and natural fertility is low or medium. Where unlimed, this soil is strongly acid to extremely acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture. It is used mainly for pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has moderately high or high potential productivity for trees, and more than half of the acreage is wooded or reverting to woody species. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope and depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IVe.

GmC—Gilpin stony silt loam, 3 to 15 percent slopes. This soil is strongly sloping or gently sloping and is well drained. It is on ridgetops and benches mostly on Allegheny Mountain in the western part of Grant County. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is black channery silt loam about 1 inch thick over yellowish brown channery silt loam about 4 inches thick. The subsoil is strong brown channery silt loam about 24 inches thick. The substratum is strong brown very channery silty clay loam that extends to bedrock at a depth of about 35 inches.

Included with this soil in mapping are a few small areas of Clymer and Wharton soils. Also included are a few small areas of nearly level soils, moderately steep soils, soils where stones cover more than 3 percent of the surface, soils with no stones on the surface, and deep soils. Included soils make up about 30 percent of this map unit.

The available water capacity of this Gilpin soil is low or moderate. Permeability is moderate. Runoff is medium or rapid, and natural fertility is low or medium. Where unlimed, this soil is strongly acid to extremely acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The hazard of erosion is moderate or severe in unprotected areas and is a management concern. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope and depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

GmE—Gilpin stony silt loam, 15 to 35 percent slopes. This soil is steep or moderately steep and is well drained. It is on benches and hillsides which are commonly dissected by drainageways. This soil is mostly on Allegheny Mountain in the western part of Grant County. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is black channery silt loam about 1 inch thick over yellowish brown channery silt loam about 3 inches thick. The subsoil is strong brown channery silt loam about 24 inches thick. The substratum is strong brown very channery silty clay loam that extends to bedrock at a depth of about 36 inches.

Included with this soil in mapping are small areas of Buchanan, Clymer, Dekalb, Ernest, and Wharton soils. Also included are a few small areas of strongly sloping soils, very steep soils, soils with no stones on the surface, and soils where stones cover more than 3 percent of the surface. A few rock outcrops are in some places. Inclusions make up about 25 percent of this map unit.

The available water capacity of this Gilpin soil is low or moderate. Permeability is moderate. Runoff is rapid or very rapid, and natural fertility is low or medium. This soil is strongly acid to extremely acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

Slope and the stones on the surface restrict the use of farm machinery and make this soil generally unsuited to cultivated crops or hay and difficult to manage for pasture. This soil has high or moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope and depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

GmF—Gilpin stony silt loam, 35 to 65 percent slopes. This soil is very steep and well drained. It is on hillsides which are commonly dissected by drainageways. This soil is mostly on Allegheny Mountain in the western part of Grant County. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is black channery silt loam about 1 inch thick over yellowish brown channery silt loam about 2 inches thick. The subsoil is strong brown channery silt loam about 23 inches thick. The substratum is strong brown very channery silty clay loam that extends to bedrock at a depth of about 35 inches.

Included with this soil in mapping are small areas of Buchanan, Clymer, Dekalb, and Ernest soils. Also included are a few small areas of steep soils, soils with no stones on the surface, soils where stones cover more than 3 percent of the surface, and rock outcrops. Inclusions make up about 25 percent of this map unit.

The available water capacity of this Gilpin soil is low or moderate. Permeability is moderate. Runoff is very rapid, and natural fertility is low or medium. This soil is strongly acid to extremely acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

Slope and the stones on the surface make this soil generally unsuited to cultivated crops, hay, or pasture. The soil has moderately high or high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope and depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

Hu—Huntington loam. This soil is nearly level and well drained. It is on flood plains of the South Branch of the Potomac River in Hardy County.

Typically, the surface layer is very dark grayish brown loam about 16 inches thick. The subsoil is dark brown silt loam and loam about 40 inches thick. The substratum is brown gravelly loam that extends to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of Chagrin, Lindside, Lobdell, Potomac, and Tioga soils. Included soils make up about 20 percent of this map unit.

The available water capacity of this Huntington soil is high. Permeability is moderate. Runoff is slow, and natural fertility is high. This soil is medium acid to mildly alkaline. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for cultivated crops. They can be grown continuously, but the soil needs the protection of a cover crop. Mixing the residue of the cover crop into the soil helps to improve fertility and tilth. Flooding damages crops in some areas. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has very high potential productivity for trees, but most areas are farmed.

A hazard of flooding is the main limitation of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control stream scouring and sedimentation.

The capability class is I.

LaC—Laidig channery loam, 8 to 15 percent slopes. This soil is strongly sloping and well drained. It is along foot slopes, in coves, and along drainageways.

Typically, the surface layer is very dark gray channery loam about 3 inches thick. The subsurface layer is dark grayish brown channery sandy loam about 3 inches thick. The subsoil is yellowish brown and is about 59 inches thick. The upper 31 inches of the subsoil is channery loam that is mottled with light brownish gray in the lower part. The lower 28 inches is very firm and brittle channery sandy loam mottled with light brownish gray, yellowish red, and strong brown. The substratum extends to a depth of 72 inches or more. It is strong brown channery loam mottled with light brownish gray and yellowish red.

Included with this soil in mapping are a few small areas of Berks, Buchanan, and Dekalb soils. Also included are small areas of gently sloping soils, moderately steep soils, reddish brown soils, soils that are friable throughout, and soils in which the firm part of the subsoil is deeper than in this Laidig soil. Included soils make up about 25 percent of the map unit.

The available water capacity of this Laidig soil is moderate. Permeability is moderate or moderately rapid above the firm part of the subsoil and moderately slow in the firm part. Runoff is rapid, and natural fertility is low. Where unlimed, this soil is strongly acid to extremely acid. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay or pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, and most of the acreage is wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope and moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

LaD—Laidig channery loam, 15 to 25 percent slopes. This soil is moderately steep and well drained. It is along foot slopes, in coves, and along small drainageways.

Typically, the surface layer is very dark gray channery loam about 3 inches thick. The subsurface layer is dark grayish brown channery sandy loam about 3 inches thick. The subsoil is yellowish brown and is about 57 inches thick. The upper 28 inches of the subsoil is channery loam that is mottled with light brownish gray in the lower part. The lower 29 inches is very firm and brittle channery sandy loam mottled with light brownish gray, yellowish red, and strong brown. The substratum extends to a depth of 72 inches or more. It is strong brown channery loam mottled with light brownish gray and yellowish red.

Included with this soil in mapping are a few small areas of Berks, Buchanan, and Dekalb soils. Also included are small areas of strongly sloping soils, steep soils, reddish brown soils, soils that are friable throughout, and soils in which the firm part of the subsoil is deeper than in this Laidig soil. Included soils make up about 25 percent of the map unit.

The available water capacity of this Laidig soil is moderate. Permeability is moderate or moderately rapid above the firm part of the subsoil and moderately slow in the firm part. Runoff is rapid, and natural fertility is low. Where unlimed, this soil is strongly acid to extremely acid. The depth to bedrock is more than 60 inches.

This soil has limited suitabiltiy for cultivated crops and is better suited to hay or pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help

to control this erosion. Slope restricts the use of equipment.

The slope and moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability unit is IVe.

LbC—Laidig stony loam, 3 to 15 percent slopes. This soil is strongly sloping or gently sloping and is well drained. It is along foot slopes, in coves, and along drainageways. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark gray channery loam about 3 inches thick. The subsurface layer is dark grayish brown channery sandy loam about 2 inches thick. The subsoil is yellowish brown and is about 60 inches thick. The upper 30 inches of the subsoil is channery loam that is mottled with light brownish gray in the lower part. The lower 30 inches is very firm and brittle channery sandy loam mottled with light brownish gray, yellowish red, and strong brown. The substratum extends to a depth of 72 inches or more. It is strong brown channery loam mottled with light brownish gray and yellowish red.

Included with this soil in mapping are a few areas of Berks, Buchanan, and Dekalb soils. Also included are small areas of moderately steep soils, very stony soils, soils that have more sand than this Laidig soil has, soils that are friable throughout, soils in which the firm part of the subsoil is deeper than in this Laidig soil, and reddish brown soils. Small areas of rubble land are also included. Inclusions make up about 30 percent of this map unit.

The available water capacity of this Laidig soil is moderate. Permeability is moderate or moderately rapid above the firm part of the subsoil and moderately slow in the firm part. Runoff is medium or rapid, and natural fertility is low. Where unlimed, this soil is strongly acid to extremely acid. The depth to bedrock is more than 60 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The hazard of erosion is moderate or severe in unprotected areas and is a management concern. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope and moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

LbE—Laidig stony loam, 15 to 35 percent slopes. This soil is steep or moderately steep and is well drained. It is along foot slopes, in coves, and along drainageways. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark gray channery loam about 3 inches thick. The subsurface layer is dark grayish brown channery sandy loam about 2 inches thick. The subsoil is yellowish brown and is about 56 inches thick. The upper 31 inches of the subsoil is channery loam that is mottled with light brownish gray in the lower part. The lower 25 inches is very firm and brittle channery sandy loam mottled with light brownish gray, yellowish red, and strong brown. The substratum extends to a depth of 72 inches or more. It is strong brown channery loam mottled with light brownish gray and yellowish red.

Included with this soil in mapping are a few small areas of Berks, Buchanan, and Dekalb soils. Also included are small areas of strongly sloping soils, very steep soils, soils where stones cover more than 3 percent of the surface, soils with more sand than this Laidig soil has, soils that are friable throughout, soils in which the firm part of the subsoil is deeper than in this Laidig soil, and reddish brown soils. Also included are small areas of silty residual soils that have a loamy surface layer about 2 feet thick and small areas of rubble land. Inclusions make up about 35 percent of the map unit.

The available water capacity of this Laidig soil is moderate. Permeability is moderate or moderately rapid above the firm part of the subsoil and moderately slow in the firm part. Runoff is rapid or very rapid, and natural fertility is low. This soil is strongly acid to extremely acid. The depth to bedrock is more than 60 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The hazard of erosion is severe or very severe in unprotected areas and is a management concern. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope and moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and

providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

LcF—Laidig very stony loam, 35 to 50 percent slopes. This soil is very steep and well drained. It is on foot slopes. Stones cover 3 to 15 percent of the surface of this soil.

Typically, the surface layer is very dark gray channery loam about 2 inches thick. The subsurface layer is dark grayish brown channery sandy loam about 4 inches thick. The subsoil is yellowish brown and is about 54 inches thick. The upper 34 inches of the subsoil is channery loam that is mottled with light brownish gray in the lower part. The lower 20 inches of the subsoil is very firm and brittle channery sandy loam mottled with light brownish gray, yellowish red, and strong brown. The substratum extends to a depth of 72 inches or more. It is strong brown channery loam mottled with light brownish gray and yellowish red.

Included with this soil in mapping are small areas of Berks and Dekalb soils. Also included are small areas of steep soils, soils with more sand than this Laidig soil has, soils that are friable throughout, soils in which the firm part of the subsoil is deeper than in this Laidig soil, and reddish brown soils. Also included are small areas of silty residual soils with a loamy surface layer about 2 feet thick and small areas of rubble land. Inclusions make up about 35 percent of the map unit.

The available water capacity of this Laidig soil is moderate. Permeability is moderate or moderately rapid above the firm part of the subsoil and moderately slow in the firm part. Runoff is very rapid, and natural fertility is low. This soil is strongly acid to extremely acid. The depth to bedrock is more than 60 inches.

Slope and the stones on the surface restrict the use of farming and timber equipment and make this soil generally unsuited to cultivated crops, hay, or pasture. The soil has moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope, stones, and moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

LdC—Leetonia rubbly loamy sand, 3 to 15 percent slopes. This soil is strongly sloping or gently sloping and is well drained to excessively drained. It is on ridgetops and benches mostly on Allegheny Mountain in the western part of Grant County.. Stones and boulders cover 50 to 90 percent of the surface of this soil.

Typically, the surface layer is black very gravelly loamy sand about 3 inches thick. The subsurface layer is light brownish gray gravelly sand about 4 inches thick. The subsoil is multicolored gravelly loamy sand 38 inches thick. The substratum is strong brown gravelly loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Buchanan Variant, Clymer, and Wharton soils. Also included are a few areas of moderately steep soils and areas of rock outcrop and rubble land. Inclusions make up about 20 percent of this map unit.

The available water capacity of this Leetonia soil is very low. Permeability is moderately rapid. Runoff is medium or rapid, and natural fertility is low. This soil is very strongly acid or extremely acid. The depth to bedrock is more than 40 inches.

The stones and boulders on the surface make this soil generally unsuited to cultivated crops, hay, or pasture. This soil has low potential productivity for trees, but most areas are wooded. Red spruce, hemlock, rhododendron, and mountain laurel are common species. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour helps to control this erosion. The stones and boulders restrict the use of equipment.

The stones and boulders, the slope, and the depth to bedrock in some areas are the main limitations of this soil for urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capabiltiy subclass is VIIs.

LeE—Lehew channery loam, 25 to 35 percent slopes. This soil is steep and well drained. It is on hillsides.

Typically, the surface layer is black channery loam about 2 inches thick. The subsurface layer is brown channery loam about 2 inches thick. The subsoil is yellowish red and reddish brown channery loam 14 inches thick. The substratum is dark reddish brown very channery sandy loam that extends to bedrock at a depth of 27 inches.

Included with this soil in mapping are a few areas of Calvin, Dekalb, and Hazleton soils. Also included are a few soils with stones on the surface, moderately steep soils, and very steep soils. Included soils make up about 25 percent of this map unit.

The available water capacity of this Lehew soil is very low or low. Permeability is moderately rapid or rapid. Runoff is very rapid, and natural fertility is low. Where unlimed, this soil is very strongly acid or strongly acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches.

Slope makes this soil generally unsuited to cultivated crops or hay, but the soil is suited to pasture. The hazard of erosion is very severe in unprotected areas and is a

major management concern. Proper stocking, rotation grazing, and establishing a permanent plant cover are the major pasture management needs.

This soil has low or moderate potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

Slope and the depth to bedrock are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIe.

LIB—Lehew and Dekalb channery loams, 3 to 8 percent slopes. This unit consists of gently sloping, well drained soils on ridgetops. The total acreage of this unit is about 50 percent Lehew soils, 30 percent Dekalb soils, and 20 percent other soils. Some areas consist mainly of Lehew soils, some mainly of Dekalb soils, and some of both. These soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Lehew soils is dark brown channery loam about 6 inches thick. The subsoil is yellowish red and reddish brown channery loam 12 inches thick. The substratum is dark reddish brown very channery sandy loam that extends to bedrock at a depth of about 26 inches.

Typically, the surface layer of the Dekalb soils is dark brown channery loam about 6 inches thick. The subsoil is yellowish brown and is about 15 inches thick. The upper 6 inches of the subsoil is channery loam, and the lower 9 inches is very channery loam. The substratum is yellowish brown very channery sandy loam that extends to bedrock at a depth of about 25 inches.

Included with these soils in mapping are a few areas of Berks, Calvin, and Hazleton soils. Also included are a few small areas of nearly level soils and strongly sloping soils. Included soils make up about 20 percent of this map unit.

The available water capacity of these Lehew and Dekalb soils is very low or low. Permeability is moderately rapid or rapid. Runoff is medium, and natural fertility is low. Where unlimed, the Lehew soils are strongly acid or very strongly acid and the Dekalb soils are strongly acid to extremely acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in these soils.

These soils are suited to cultivated crops and to hay and pasture. They are used mainly for pasture and hay. Because of droughtiness during summer, however, the soils are better suited to early-maturing small grains than to late-maturing crops such as corn. The hazard of erosion is moderate in unprotected areas and is a major management concern. If the soils are cultivated, cultivating on the contour, hay in the crop sequence, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the main pasture management needs.

These soils have moderate potential productivity for trees, but most areas have been cleared. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The depth to bedrock is the main limitation of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIe.

LIC—Lehew and Dekalb channery loams, 8 to 15 percent slopes. This unit consists of strongly sloping, well drained soils on ridgetops and benches. The total acreage of this unit is about 50 percent Lehew soils, 30 percent Dekalb soils, and 20 percent other soils. Some areas consist mainly of Lehew soils, some mainly of Dekalb soils, and some of both. These soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Lehew soils is dark brown channery loam about 6 inches thick. The subsoil is yellowish red and reddish brown channery loam 10 inches thick. The substratum is dark reddish brown very channery sandy loam that extends to bedrock at a depth of about 24 inches.

Typically, the surface layer of the Dekalb soils is dark brown channery loam about 6 inches thick. The subsoil is yellowish brown and is about 15 inches thick. The upper 6 inches of the subsoil is channery loam, and the lower 9 inches is very channery loam. The substratum is yellowish brown very channery sandy loam that extends to bedrock at a depth of about 25 inches.

Included with these soils in mapping are a few areas of Berks, Calvin, and Hazleton soils. Also included are a few soils with stones on the surface, gently sloping soils, and moderately steep soils. Included soils make up about 20 percent of this map unit.

The available water capacity of these Lehew and Dekalb soils is very low or low. Permeability is moderately rapid or rapid. Runoff is rapid, and natural fertility is low. Where unlimed, the Lehew soils are strongly acid or very strongly acid and the Dekalb soils are strongly acid to extremely acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in these soils.

These soils are suited to cultivated crops and to hay and pasture. Because of droughtiness during summer, however, the soils are better suited to early-maturing

small grains than to late-maturing crops such as corn. The hazard of erosion is severe in unprotected areas and is a major management concern. If the soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the main pasture management needs.

These soils have moderate potential productivity for trees, but most areas have been cleared. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The depth to bedrock and slope are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

LID—Lehew and Dekalb channery loams, 15 to 25 percent slopes. This unit consists of moderately steep, well drained soils on benches and hillsides. The total acreage of this unit is about 45 percent Lehew soils, 35 percent Dekalb soils, and 20 percent other soils. Some areas consist mainly of Lehew soils, some mainly of Dekalb soils, and some of both. These soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Lehew soils is black channery loam about 2 inches thick. The subsurface layer is brown channery loam 2 inches thick. The subsoil is yellowish red and reddish brown channery loam 13 inches thick. The substratum is dark reddish brown very channery sandy loam that extends to bedrock at a depth of about 26 inches.

Typically, the surface layer of the Dekalb soils is black channery loam about 3 inches thick. The subsurface layer is yellowish brown channery loam about 4 inches thick. The subsoil is yellowish brown and is about 15 inches thick. The upper 5 inches of the subsoil is channery loam, and the lower 10 inches is very channery loam. The substratum is yellowish brown very channery sandy loam that extends to bedrock at a depth of about 26 inches.

Included with these soils in mapping are a few areas of Berks, Calvin, and Hazleton soils. Also included are a few soils with stones on the surface, strongly sloping soils, and steep soils. Included soils make up about 20 percent of this map unit.

The available water capacity of these Lehew and Dekalb soils is very low or low. Permeability is moderately rapid or rapid. Runoff is rapid, and natural fertility is low. Where unlimed, the Lehew soils are strongly acid or very strongly acid and the Dekalb soils are strongly acid to extremely acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in these soils.

The soils have limited suitability for cultivated crops and are better suited to hay and pasture. Because of droughtiness during summer, the soils are better suited to early-maturing small grains than to late-maturing crops such as corn. The hazard of erosion is severe in unprotected areas and is a major management concern. If the soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the main pasture management needs.

These soils have low or moderate potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope and depth to bedrock are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IVe.

Lm—Lickdale stony loam. This soil is nearly level and very poorly drained. It is on upland flats, in depressions, and along drainageways. It is on Allegheny Mountain in the western part of Grant County. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark gray loam about 3 inches thick. The subsurface layer is gray loam about 3 inches thick. The subsoil is about 24 inches thick. The upper 8 inches of the subsoil is gray loam. The lower 16 inches is gray clay loam mottled with strong brown. The substratum extends to a depth of 60 inches or more. It is gray silt loam mottled with strong brown.

Included with this soil in mapping are a few areas of Cavode soils. Also included are a few areas of soils with no stones on the surface and soils that have more sand in the subsoil than this Lickdale soil has. Included soils make up about 25 percent of this map unit.

The available water capacity of this Lickdale soil is moderate or high. Permeability is slow or very slow. Runoff is slow, and natural fertility is low. A seasonal high water table at or near the surface restricts the root zone of some types of plants. Water is ponded on the surface during wet seasons. The soil is strongly acid to extremely acid. The depth to bedrock is generally 42 to 72 inches.

The seasonal high water table makes this soil generally unsuited to cultivated crops or hay and difficult

to manage for pasture. Artificial drainage is needed if the soil is used for pasture, and providing drainage is the major management concern. Most areas lack suitable drainage outlets. Water-tolerant plants, proper stocking rates, rotation grazing, and deferred grazing in the spring until the soil is firm are the major pasture management needs.

This soil has very high potential productivity for trees that tolerate wetness, and most areas are wooded or reverting to woody species. The use of equipment is restricted because the soil is soft.

The seasonal high water table, ponding, and slow or very slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is VIIs.

Ln—Lindside and Lobdell soils. This unit consists of nearly level, moderately well drained soils on flood plains. The total acreage of this unit is about 40 percent Lindside soils, 35 percent Lobdell soils, and 25 percent other soils. Some areas consist mainly of Lindside soils, some mainly of Lobdell soils, and some of both. The soils were mapped together because they have no major differences in use and management.

Typically, the surface layer of the Lindside soils is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 33 inches thick. The upper 5 inches of the subsoil is very dark grayish brown silt loam. The next 4 inches is dark brown silt loam. The lower 24 inches is brown silt loam and silty clay loam that is mottled with pinkish gray and dark reddish brown. The substratum extends to a depth of 60 inches. It is brown fine sandy loam and clay loam mottled with gray.

Typically, the surface layer of the Lobdell soils is dark brown loam about 10 inches thick. The subsoil is dark brown loam about 15 inches thick and is mottled with grayish brown, dark grayish brown, and strong brown in the lower part. The substratum extends to a depth of 60 inches or more. It is dark brown loam and gravelly fine sandy loam mottled with yellowish red, grayish brown, and dark reddish brown.

Included with these soils in mapping are a few small areas of Chagrin, Dunning, Huntington, Melvin, and Potomac soils. Also included are a few small areas of gently sloping soils and soils that have more sand in the subsoil than these Lindside or Lobdell soils have.

The available water capacity of these Lindside and Lobdell soils is high. Permeability is moderate. Runoff is slow, and natural fertility is moderate or high. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. The Lindside soils are medium acid to mildly alakline, and the Lobdell soils are medium acid to neutral. The depth to bedrock is more than 60 inches.

These soils are suited to cultivated crops and to hay and pasture. Some small wet areas need artificial drainage if desirable crops are to be grown, and crops are subject to damage from flooding. Cultivated crops can be grown continuously on these soils, but the soil needs the protection of a cover crop. Delaying tillage until the soils are reasonably dry and mixing the residue from the cover crop into the soils will help to improve fertility and tilth. Proper stocking rates, rotation grazing, and deferred grazing in the spring until the soils are reasonably firm are major pasture management needs.

These soils have very high potential productivity for trees, but only a small acreage is wooded. The use of equipment is restricted during wet seasons because the soils are soft.

A hazard of flooding and the seasonal high water table are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control stream scouring and sedimentation.

The capability subclass is IIw.

LrF—Lithic Udorthents-Rock outcrop complex, 35 to 80 percent slopes. This unit consists of very steep, excessively drained soils and rock outcrop. The unit is on severely eroded hillsides, most of which are south- or west-facing (fig. 5). This unit is about 50 percent Lithic Udorthents, 45 percent Rock outcrop, and 5 percent other soils. The soils and rock are so intermingled that it was not practical to map them separately.

Typically, the Lithic Udorthents consist of yellowish brown very shaly or very channery silt loam less than 10 inches thick over bedrock. The Rock outcrop consists of areas of exposed shale bedrock.

Included with this unit in mapping are a few areas of Berks and Weikert soils.

The available water capacity of the Lithic Udorthents is very low, and the soil is droughty. Permeability is rapid. Runoff is very rapid, and natural fertility is low. This soil is strongly acid or very strongly acid.

This unit is not suited to farming. It has very low potential productivity for trees, and most areas are sparsely wooded with pine, chestnut oak, and scrub oak.

Slope and the depth to bedrock are the main limitations of this unit for urban uses. Establishing a plant cover on unprotected areas and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIIe.

Ma—Massanetta loam. This soil is nearly level and moderately well drained or well drained. It is on flood plains below large springs. In some areas, marl from this soil has been used as a source of agricultural lime. Slopes range from 0 to 3 percent.

Figure 5.—An area of Lithic Udorthents-Rock outcrop complex, 35 to 80 percent slopes.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is about 39 inches thick. The upper 9 inches of the subsoil is very dark gray silt loam. The next 12 inches is dark grayish brown loam. The lower 18 inches is grayish brown loam mottled with yellowish brown. The substratum extends to a depth of 60 inches or more. It is light brownish gray gravelly sandy loam mottled with yellow and red.

Included with this soil in mapping are a few areas of Dunning, Lindside, Lobdell, and Melvin soils. Also included are a few areas of gently sloping soils and strongly sloping soils. Included soils make up about 35 percent of this map unit.

The available water capacity of this Massanetta soil is moderate or high. Permeability is moderate. Runoff is slow, and natural fertility is high. A seasonal high water table about 2 to 3.5 feet below the surface restricts the root zone of some plants. This soil is mildly alkaline or moderately alkaline. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for cultivated crops. They can be grown continuously, but the soil needs the protection of a cover crop. Mixing the residue of the cover crop into the soil helps to improve fertility and tilth. Flooding damages crops in some areas. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has high potential productivity for trees, but few areas are wooded.

A hazard of flooding and the seasonal high water table are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control stream scouring and sedimentation.

The capability subclass is IIIw.

Me—Melvin silt loam. This soil is nearly level and poorly drained. It is on flood plains. Slopes range from 0 to 3 percent.

Typically, the surface layer is dark gray silt loam mottled with yellowish red and is about 9 inches thick. The subsoil is about 23 inches thick. It is gray and light gray silt loam and is mottled with strong brown and brownish yellow. The substratum extends to a depth of 60 inches or more. It is light gray silt loam mottled with strong brown and light reddish brown.

Included with this soil in mapping are a few areas of Dunning, Lindside, and Lobdell soils. Also included are a few soils that have more sand and rock fragments than this Melvin soil has. Included soils make up about 35 percent of this map unit.

The available water capacity of this Melvin soil is high. Permeability is moderate. Runoff is slow, and natural fertility is high. A seasonal high water table at or near the surface restricts the root growth of plants. This soil is medium acid to mildly alkaline in the surface layer and upper part of the subsoil and slightly acid to mildly alkaline in the lower part of the subsoil and in the substratum. The depth to bedrock is more than 60 inches.

If adequately drained, this soil is suited to cultivated crops and to hay and pasture, especially water-tolerant grasses and legumes, but flooding is a hazard for crops in some areas of this soil. If this soil is cultivated, conservation tillage, delaying tillage until the soil is reasonably dry, and using crop residue on or in the soil help to maintain fertility and tilth. Proper stocking rates, rotation grazing, and deferred grazing in the spring until the soil is reasonably firm are major pasture management needs.

This soil has very high potential productivity for water-tolerant trees, but only a small acreage is wooded. The use of equipment is restricted during wet seasons because the soil is soft.

The seasonal high water table and a hazard of flooding are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control stream scouring and sedimentation.

The capability subclass is IIIw.

MfC—Mertz cherty loam, 8 to 15 percent slopes. This soil is strongly sloping and well drained. It is on narrow ridgetops and along foot slopes.

Typically, the surface layer is very dark gray cherty loam about 2 inches thick. The subsurface layer is dark grayish brown very cherty sandy loam 2 inches thick and yellowish brown cherty loam 4 inches thick. The subsoil is about 47 inches thick. The upper 10 inches of the subsoil is yellowish brown very cherty loam. The lower 37 inches is yellowish red and red cherty and very cherty silty clay loam. The substratum is strong brown very cherty sandy clay loam to a depth of 60 inches or more.

Included with this soil in mapping are a few areas of Elliber and Murrill soils. Also included are a few areas of moderately steep soils, soils with stones on the surface, and soils that have more clay in the subsoil than this Mertz soil has. Included soils make up about 20 percent of the map unit.

The available water capacity of this Mertz soil is moderate or high. Permeability is moderately slow. Runoff is rapid, and natural fertility is low or medium. The soil is strongly acid to neutral in the surface layer, subsurface layer, and upper part of the subsoil. It is strongly acid or very strongly acid in the lower part of the subsoil and in the substratum. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for pasture and hay. Chert fragments in the surface layer make tillage difficult. The hazard of erosion is severe in unprotected areas and is a management concern. If this soil is cultivated, conservation tillage, crops in contour, hay in the crop sequence, and crop residue on and in the soil help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the major pasture management needs.

This soil has high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope and moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

MfD—Mertz cherty loam, 15 to 25 percent slopes. This soil is moderately steep and well drained. It is on side slopes and foot slopes.

Typically, the surface layer is very dark gray cherty loam about 2 inches thick. The subsurface layer is dark grayish brown very cherty sandy loam 2 inches thick and yellowish brown cherty loam 3 inches thick. The subsoil is about 46 inches thick. The upper 11 inches of the subsoil is yellowish brown very cherty loam. The lower 35 inches is yellowish red and red cherty and very cherty silty clay loam. The substratum is strong brown very cherty sandy clay loam to a depth of 60 inches or more.

Included with this soil in mapping are a few areas of Elliber and Murrill soils. Also included are a few areas of steep soils, soils with stones on the surface, and soils that have more clay in the subsoil than this Mertz soil has. Included soils make up about 20 percent of this map unit.

The available water capacity of this Mertz soil is moderate or high. Permeability is moderately slow. Runoff is rapid, and natural fertility is low or medium. The soil is strongly acid to neutral in the surface layer, subsurface layer, and upper part of the subsoil. It is strongly acid or very strongly acid in the lower part of the subsoil and in the substratum. The depth to bedrock is more than 60 inches.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture. Chert fragments in the surface layer hinder tillage. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has high potential productivity for trees, but less than half the acreage is wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope and moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IVe.

MhA—Monongahela silt loam, 0 to 3 percent slopes. This soil is nearly level and moderately well drained. It is on stream terraces that are above overflow.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is yellowish brown and is about 33 inches thick. The upper 10 inches of the subsoil is silt loam. The next 8 inches is very firm and brittle silt loam mottled with light brownish gray. The lower 15 inches is firm and brittle silt loam mottled with light brownish gray and yellowish red. The substratum extends to a depth of 60 inches or more. It is yellowish brown, firm gravelly silt loam mottled with light brownish gray and yellowish red.

Included with this soil in mapping are a few areas of Allegheny, Monongahela Variant, and Tygart soils. Also included are a few areas of cobbly soils, gently sloping soils, reddish brown soils, soils that are friable throughout, and soils in which the firm part of the subsoil is deeper than in this Monongahela soil. Included soils make up about 30 percent of this map unit.

The available water capacity of this Monongahela soil is moderate. Permeability is moderate above the firm part of the subsoil and moderately slow or slow in the firm part. Runoff is slow, and natural fertility is low. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. Where unlimed, this soil is strongly acid or very strongly acid. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture,but crops in some small wet areas need drainage. Cultivated crops can be grown continuously, but the soil needs the protection of a cover crop. Delaying tillage until the soil is dry and mixing the residue of the cover crop into the soil helps to improve fertility and tilth. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, but only a small acreage is wooded. The use of equipment is restricted during wet periods because this soil is soft.

The seasonal high water table and moderately slow or slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is IIw.

MhB—Monongahela silt loam, 3 to 8 percent slopes. This soil is gently sloping and moderately well drained. It is on stream terraces that are above overflow.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsurface layer is yellowish brown silt loam about 3 inches thick. The subsoil is yellowish brown and is about 32 inches thick. The upper 10 inches of the subsoil is silt loam. The next 6 inches is very firm and brittle silt loam mottled with light brownish gray. The lower 16 inches is firm and brittle silt loam mottled with light brownish gray and yellowish red. The substratum extends to a depth of 60 inches or more. It is yellowish brown, firm gravelly silt loam mottled with light brownish gray and yellowish red.

Included with this soil in mapping are a few areas of Allegheny, Monongahela Variant, and Tygart soils. Also included are a few areas of cobbly soils, nearly level soils, strongly sloping soils, moderately steep soils, reddish brown soils, soils that are friable throughout, soils that have more clay in the subsoil than this Monongahela soil does, and soils in which the firm part of the subsoil is deeper than in this Monongahela soil. Included soils make up about 30 percent of this map unit.

The available water capacity of this Monongahela soil is moderate. Permeability is moderate above the firm part of the subsoil and moderately slow or slow in the firm part. Runoff is medium, and natural fertility is low. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. Where unlimed, this soil is strongly acid or very strongly acid. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture, but crops in some small wet areas need drainage. The hazard of erosion is moderate in cultivated areas and is a management concern. If this soil is cultivated, cultivating on the contour, hay in the crop sequence, crop residue on and in the soil, and delaying tillage until the soil is dry will help to control erosion and maintain fertility and tilth. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because this soil is soft.

The seasonal high water table and moderately slow or slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIe.

MhC—Monongahela silt loam, 8 to 15 percent slopes. This soil is strongly sloping and moderately well drained. It is on stream terraces that are above overflow.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsurface layer is yellowish brown silt loam about 2 inches thick. The subsoil is yellowish brown and is about 31 inches thick. The upper 8 inches of the subsoil is silt loam. The next 7 inches is very firm and brittle silt loam mottled with light brownish gray. The lower 16 inches is firm and brittle silt loam mottled with light brownish gray and yellowish red. The substratum extends to a depth of 60 inches or more. It is yellowish brown, firm gravelly silt loam mottled with light brownish gray and yellowish red.

Included with this soil in mapping are a few areas of Allegheny, Monongahela Variant, and Tygart soils. Also included are a few areas of cobbly soils, gently sloping soils, moderately steep soils, reddish brown soils, soils that are friable throughout, soils that have more clay in the subsoil than this Monongahela soil has, and soils in which the firm part of the subsoil is deeper than in this Monongahela soil. Included soils make up about 30 percent of this map unit.

The available water capacity of this Monongahela soil is moderate. Permeability is moderate above the firm part of the subsoil and moderately slow or slow in the firm part. Runoff is rapid, and natural fertility is low. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. Where unlimed, this soil is strongly acid or very strongly acid. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, and about half of the acreage is wooded. Erosion on logging roads and skid trails is the main management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because this soil is soft.

The seasonal high water table, slope, and moderately slow or slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

MkB—Monongahela Variant fine sandy loam, 3 to 8 percent slopes. This soil is gently sloping and moderately well drained. It is mainly along the Cacapon River.

Typically, the surface layer is dark brown fine sandy loam about 9 inches thick. The subsoil is about 34 inches thick. The upper 10 inches of the subsoil is yellowish brown fine sandy loam. The next 11 inches is strong brown fine sandy loam mottled with light brownish gray. The lower 13 inches is very firm, brittle, yellowish brown fine sandy loam mottled with light brownish gray and reddish brown. The substratum extends to a depth of 60 inches or more. It is firm, yellowish brown gravelly fine sandy loam mottled with light brownish gray and red.

Included with this soil in mapping are a few areas of Allegheny Variant and Monongahela soils. Also included are soils with a gravelly or very gravelly subsoil and few small areas of poorly drained soils and strongly sloping soils. Included soils make up about 20 percent of this map unit.

The available water capacity of this Monongahela Variant soil is moderate. Permeability is moderate or moderately rapid above the firm part of the subsoil and moderately slow or slow in the firm part. Runoff is medium, and natural fertility is low. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. Where unlimed, this soil is strongly acid or very strongly acid. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for cultivated crops and hay. The hazard of erosion is moderate in cultivated areas and is a management concern. If this soil is cultivated, cultivating on the contour, hay in the crop sequence, and crop residue on and in the soil will help to control

erosion and maintain fertility and tilth. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The seasonal high water table and moderately slow or slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIe.

MIC—Murrill cherty silt loam, 8 to 15 percent slopes. This soil is strongly sloping and well drained. It is on foot slopes and benches and on a few ridgetops.

Typically, the surface layer is very dark gray cherty silt loam about 3 inches thick. The subsurface layer is brown cherty silt loam about 6 inches thick. The subsoil extends to a depth of 75 inches or more. In sequence downward, it is 11 inches of yellowish brown cherty loam, 11 inches of strong brown cherty silt loam, 16 inches of strong brown cherty clay loam, and 8 inches of yellowish red cherty silty clay loam. The rest of the subsoil is yellowish red cherty silty clay.

Included with this soil in mapping are a few small areas of Dekalb and Elliber soils. Also included are small areas of gently sloping soils, moderately steep soils, moderately well drained soils, soils with stones on the surface, and soils that do not have a cherty surface layer. Included soils make up about 30 percent of the map unit.

The available water capacity of this Murrill soil is moderate or high. Permeability is moderate in the upper part of the subsoil and moderate or moderately slow in the lower part of the subsoil. Where unlimed, the soil is medium acid to very strongly acid. Runoff is rapid, and natural fertility is medium. The depth to bedrock is more than 72 inches.

This soil is suited to cultivated crops and to hay and pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

The soil has moderately high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

Slope is the main limitation of this soil for most urban uses. The limestone in some areas is cavernous and allows pollutants from waste-disposal systems to enter the ground water. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

MID—Murrill cherty silt loam, 15 to 25 percent slopes. This soil is moderately steep and well drained. It is on foot slopes and benches.

Typically, the surface layer is very dark gray cherty silt loam about 3 inches thick. The subsurface layer is brown cherty silt loam about 6 inches thick. The subsoil extends to a depth of 75 inches or more. In sequence downward, it is 11 inches of yellowish brown cherty loam, 11 inches of strong brown cherty silt loam, 16 inches of strong brown cherty clay loam, and 8 inches of yellowish red cherty silty clay loam. The rest of the subsoil is yellowish red cherty silty clay.

Included with this soil in mapping are a few areas of Dekalb and Elliber soils. Also included are small areas of strongly sloping soils, steep soils, soils with stones on the surface, and soils that do not have a cherty surface layer. Included soils make up about 30 percent of the map unit.

The available water capacity of this Murrill soil is moderate or high. Permeability is moderate in the upper part of the subsoil and moderate or moderately slow in the lower part of the subsoil. Where unlimed, the Murrill soil is medium acid to very strongly acid. Runoff is rapid, and natural fertility is medium. The depth to bedrock is more than 72 inches.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, and most areas are wooded. Erosion control on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help control erosion. Slope restricts the use of equipment.

Slope is the main limitation of this soil for most urban uses. The limestone in some areas is cavernous and allows pollutants from waste-disposal systems to enter the ground water. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IVe.

MsC—Murrill stony loam, 8 to 15 percent slopes. This soil is strongly sloping and well drained. It is along foot slopes, in coves, on benches, and along drainageways. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark gray channery loam about 3 inches thick. The subsurface layer is brown channery loam about 6 inches thick. The subsoil extends to a depth of 75 inches or more. In sequence downward, it is 11 inches of yellowish brown channery loam, 11 inches of strong brown channery silt loam, 16 inches of strong brown channery clay loam, and 8 inches of yellowish red channery silty clay loam. The rest of the subsoil is yellowish red channery silty clay.

Included with this soil in mapping are a few areas of Dekalb and Elliber soils. Also included are small areas of gently sloping soils, moderately steep soils, moderately well drained soils, soils with no stones on the surface, soils where stones cover more than 3 percent of the surface, and soils in which the surface layer and upper part of the subsoil have more clay than this Murrill soil has. Included soils make up about 30 percent of the map unit.

The available water capacity of this Murrill soil is moderate or high. Permeability is moderate in the upper part of the subsoil and moderate or moderately slow in the lower part of the subsoil. Where unlimed, the Murrill soil is medium acid to very strongly acid. Runoff is rapid, and natural fertility is medium. The depth to bedrock is more than 72 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The hazard of erosion is severe in unprotected areas and is a management concern. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

Slope is the main limitation of this soil for most urban uses. The limestone in some areas is cavernous and allows pollutants from waste-disposal systems to enter the ground water. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

MsD—Murrill stony loam, 15 to 35 percent slopes. This soil is moderately steep or steep and is well drained. It is along foot slopes, in coves, on benches, and along drainageways. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark gray channery loam about 2 inches thick. The subsurface layer is brown channery loam about 7 inches thick. The subsoil extends to a depth of 75 inches or more. In sequence downward, it is 11 inches of yellowish brown channery loam, 11 inches of strong brown channery silt loam, 16 inches of strong brown channery clay loam, and 8 inches of yellowish red channery silty clay loam. The rest of the subsoil is yellowish red channery silty clay.

Included with this soil in mapping are a few small areas of Dekalb and Elliber soils. Also included are small areas of strongly sloping soils, very steep soils, soils with no stones on the surface, soils where stones cover more than 3 percent of the surface, and soils in which the surface layer and upper part of the subsoil have more clay than this Murrill soil has. Included soils make up about 30 percent of the map unit.

The available water capacity of this Murrill soil is moderate or high. Permeability is moderate in the upper part of the subsoil and moderate or moderately slow in the lower part of the subsoil. This Murrill soil is medium acid to very strongly acid. Runoff is rapid or very rapid, and natural fertility is medium. The depth to bedrock is more than 72 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The hazard of erosion is severe or very severe in unprotected areas and is a management concern. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

Slope is the main limitation of this soil for most urban uses. The limestone in some areas is cavernous and allows pollutants from waste-disposal systems to enter the ground water. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

MsF—Murrill stony loam, 35 to 65 percent slopes. This soil is very steep and well drained. It is on foot slopes and hillsides. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark gray channery loam about 2 inches thick. The subsurface layer is brown channery loam about 3 inches thick. The subsoil extends to a depth of 69 inches or more. In sequence downward, it is 12 inches of yellowish brown channery loam, 9 inches of strong brown channery silt loam, 15 inches of strong brown channery clay loam, and 7 inches of

yellowish red channery silty clay loam. The rest of the subsoil is yellowish red channery silty clay.

Included with this soil in mapping are a few small areas of Dekalb and Elliber soils. Also included are small areas of steep soils and soils where stones cover more than 3 percent of the surface. Included soils make up about 30 percent of the map unit.

The available water capacity of this Murrill soil is moderate or high. Permeability is moderate in the upper part of the subsoil and moderate or moderately slow in the lower part of the subsoil. This Murrill soil is medium acid or very strongly acid. Runoff is very rapid, and natural fertility is medium.

The slope and the stones on the surface restrict the use of farm machinery and make this soil generally unsuited to cultivated crops or hay and difficult to manage for pasture. This soil has moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

Slope is the main limitation of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

MvC—Murrill Variant channery fine sandy loam, 8 to 15 percent slopes. This soil is strongly sloping and well drained. It is on ridgetops and benches.

Typically, the surface layer is dark grayish brown channery fine sandy loam about 4 inches thick. The subsurface layer is light yellowish brown channery fine sandy loam about 5 inches thick. The subsoil is about 47 inches thick. In sequence downward, it is 6 inches of light yellowish brown and yellowish brown fine sandy loam mottled with yellowish red, 7 inches of red silty clay, 8 inches of red clay loam mottled with yellowish brown, 9 inches of red silty clay loam, and 17 inches of red clay loam mottled with light olive brown. The substratum extends to a depth of 60 inches or more. It is red clay loam mottled with light olive brown.

Included with this soil in mapping are a few areas of Dekalb and Laidig soils. Also included are moderately well drained soils, gently sloping soils, moderately steep soils, and soils with a gravelly subsoil. Included soils make up about 30 percent of this map unit.

The available water capacity of this Murrill Variant soil is moderate or high. Permeability is moderately slow. Runoff is rapid, and natural fertility is low or medium. Where unlimed, this soil is medium acid to very strongly acid. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, and more than half of the acreage is wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope and the moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIe.

MvD—Murrill Variant channery fine sandy loam, 15 to 25 percent slopes. This soil is moderately steep and well drained. It is on benches.

Typically, the surface layer is dark grayish brown channery fine sandy loam about 3 inches thick. The subsurface layer is light yellowish brown channery fine sandy loam about 4 inches thick. The subsoil is about 49 inches thick. In sequence downward, it is 8 inches of light yellowish brown and yellowish brown fine sandy loam mottled with yellowish red, 7 inches of red silty clay, 8 inches of red clay loam mottled with yellowish brown, 9 inches of red silty clay loam, and 17 inches of red clay loam mottled with light olive brown. The substratum extends to a depth of 60 inches or more. It is red clay loam mottled with light olive brown.

Included with this soil in mapping are a few areas of Dekalb and Laidig soils. Also included are moderately well drained soils, strongly sloping soils, and steep soils. Included soils make up about 30 percent of this map unit.

The available water capacity of the Murrill Variant soil is moderate or high. Permeability is moderately slow. Runoff is rapid, and natural fertility is low or medium. Where unlimed, this soil is medium acid to very strongly acid. The depth to bedrock is more than 60 inches.

This soil has limited suitability for cultivated crops and is better suited to hay or pasture. The hazard of erosion is severe in unprotected areas and is the major management concern. If this soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help

to control this erosion. Slope restricts the use of equipment.

The slope and the moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IVe.

OpC—Opequon silt loam, very rocky, 3 to 15 percent slopes. This soil is strongly sloping or gently sloping and is well drained. It is on ridgetops and benches. Limestone outcrops cover 5 to 10 percent of the surface of this soil.

Typically, the surface layer is brown silt loam about 4 inches thick. The subsoil is red silty clay that extends to bedrock at a depth of 18 inches.

Included with this soil in mapping are small areas of Edom, Elliber, and Murrill soils. Also included are severely eroded soils, soils with stones on the surface, and Opequon soils without areas of rock outcrop. Included soils make up about 25 percent of this map unit.

The available water capacity of this Opequon soil is low or very low. Permeability is moderate or moderately slow. Runoff is medium or rapid, and natural fertility is high. This soil is medium acid to mildly alkaline. Root growth is restricted by bedrock at a depth of 12 to 20 inches.

The rock on the surface limits the use of farm machinery and makes this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. The hazard of erosion is severe in unprotected areas and is a management concern. Proper stocking rates, establishing a permanent plant cover on bare areas, and rotation grazing are the main pasture management needs.

This soil has moderate potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a main management concern, and the rock outcrops limit the use of equipment. Placing the roads and trails on the contour will help to control the erosion.

The depth to bedrock, the rockiness, low strength, and a shrink-swell potential are the main limitations of this soil for most urban uses. The limestone in some areas is cavernous and allows pollutants from waste-disposal systems to enter the ground water. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability unit is VIs.

OpE—Opequon silt loam, very rocky, 15 to 35 percent slopes. This soil is steep or moderately steep and is well drained. It is on benches and hillsides. Limestone outcrops cover 5 to 10 percent of the surface of this soil.

Typically, the surface layer is dark brown silt loam about 2 inches thick. The subsurface layer is reddish brown silt loam about 3 inches thick. The subsoil is red silty clay that extends to bedrock at a depth of 16 inches.

Included with this soil in mapping are small areas of Edom, Elliber, and Murrill soils. Also included are severely eroded soils, channery soils, very cherty soils, soils with stones on the surface, Opequon soils without areas of rock outcrop, strongly sloping soils, and very steep soils. Included soils make up about 25 percent of this map unit.

The available water capacity of this Opequon soil is low or very low. Permeability is moderate or moderately slow. Runoff is rapid or very rapid, and natural fertility is high. This soil is medium acid to mildly alkaline. Root growth is restricted by bedrock at a depth of 12 to 20 inches.

The rock on the surface limits the use of machinery and makes this soil generally unsuited to cultivated crops or hay and difficult to manage for pasture. The hazard of erosion is very severe in unprotected areas. Proper stocking rates, rotation grazing, and establishing a permanent plant cover on bare areas are major pasture management needs.

This soil has low or moderate potential productivity for trees, and about half of the acreage is wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope and the rock outcrops restrict the use of quipment.

The slope, rockiness, and depth to bedrock and a shrink-swell potential and low strength are the main limitations of this soil for most urban uses. The limestone in some areas is cavernous and allows pollutants from waste-disposal systems to enter the ground water. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

OpF—Opequon silt loam, very rocky, 35 to 65 percent slopes. This soil is very steep and well drained. It is on hillsides. Limestone outcrops cover 5 to 10 percent of the surface of this soil.

Typically, the surface layer is dark brown silt loam about 2 inches thick. The subsurface layer is reddish brown silt loam about 3 inches thick. The subsoil is red silty clay that extends to bedrock at a depth of 16 inches.

Included with this soil in mapping are small areas of Edom, Elliber, and Murrill soils. Also included are severely eroded soils, channery soils, very cherty soils, soils with stones on the surface, steep soils, and

Opequon soils without areas of rock outcrop. Included soils make up about 25 percent of this map unit.

The available water capacity of this Opequon soil is low or very low. Permeability is moderate or moderately slow. Runoff is very rapid, and natural fertility is high. This soil is medium acid to mildly alkaline. Root growth is restricted by bedrock at a depth of 12 to 20 inches.

The rock on the surface and the slope make this soil generally unsuited to cultivated crops or hay and difficult to manage for pasture. The soil has low or moderate potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the main management concern, and placing the roads and trails on the contour will help to control this erosion. The slope and rock outcrops restrict the use of equipment.

The slope, rockiness, and depth to bedrock and a shrink-swell potential and low strength are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

Pb—Potomac fine sandy loam. This soil is nearly level and somewhat excessively drained. It is on flood plains of most streams throughout the survey area. Slopes range from 0 to 3 percent.

Typically, the surface layer is dark yellowish brown fine sandy loam about 7 inches thick over dark brown fine sandy loam about 3 inches thick. The substratum extends to a depth of 60 inches or more. It is dark yellowish brown very cobbly and very gravelly loamy sand.

Included with this soil in mapping are a few areas of Basher, Chagrin, Lindside, Lobdell, Melvin, and Tioga soils; gently sloping soils; and soils with a gravelly surface layer. Also included are a few strongly acid to extremely acid soils on Allegheny Mountain in the western part of Grant County and a few soils that do not have gravel and cobbles in the upper 3 feet. Included soils make up about 35 percent of this map unit.

The available water capacity of this Potomac soil is very low or low. Permeability is rapid or very rapid. Runoff is slow, and natural fertility is medium. This soil is strongly acid to neutral. The depth to bedrock is more than 60 inches.

This soil has limited suitability for cultivated crops and is better suited to hay and pasture. Because of droughtiness during summer, the soil is better suited to early-maturing small grains than to late-maturing crops such as corn. In many places the gravelly and cobbly layers interfere with tillage. The hazard of erosion is severe in unprotected areas and is a major management concern. If the soil is cultivated, conservation tillage, cultivating on the contour, hay in the crop sequence, sod in shallow drainageways, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has moderately high potential productivity for trees, but only a small acreage is wooded.

A hazard of flooding, the rapid or very rapid permeability, and the gravel content are the main limitations of this soil for most urban uses. This soil is commonly used as a source of gravel. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control stream scouring and sedimentation.

The capability subclass is IVs.

Pc—Potomac cobbly loam. This soil is nearly level and somewhat excessively drained. It is on flood plains of most streams throughout the survey area. Slopes range from 0 to 3 percent.

Typically, the surface layer is dark brown cobbly loam about 3 inches thick over very cobbly sandy loam about 2 inches thick. The substratum is dark yellowish brown very gravelly and very cobbly loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are a few areas of Basher, Chagrin, Lindside, Lobdell, Melvin, and Tioga soils. Also included are a few gently sloping soils and, in the Allegheny Mountain part of western Grant County, a few strongly acid to extremely acid soils. Included soils make up about 35 percent of this map unit.

The available water capacity of this Potomac soil is very low or low. Permeability is rapid or very rapid. Runoff is slow, and natural fertility is medium. This soil is strongly acid to neutral. The depth to bedrock is more than 60 inches.

This soil is not suited to cultivated crops and hay, but it is suited to pasture. The rock fragments in the surface layer restrict the use of farm machinery, and crops are subject to occasional damage from flooding. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, but only a small acreage is wooded.

A hazard of flooding, the rapid or very rapid permeability, and the gravel content are the main limitations of this soil for most urban uses. This soil is commonly used as a source of gravel. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control stream scouring and sedimentation.

The capability subclass is Vs.

Pu—Purdy silt loam. This soil is nearly level and poorly drained or very poorly drained. It is on terraces of the major streams of the survey area.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 22 inches thick. The upper 4 inches of the subsoil is grayish brown silty clay loam mottled with red. The lower 18 inches is grayish brown and gray silty clay mottled with red and light brownish gray. The substratum extends to a depth of 60 inches or more. It is gray clay and silty clay mottled with red and strong brown.

Included with this soil in mapping are a few areas of Tygart soils and very poorly drained soils with a black surface layer. Also included are a few areas with less clay in the upper part of the subsoil than this Purdy soil has. Some areas of this soil in the Cacapon River watershed have more sand and gravel in the lower part of the subsoil and in the substratum than this Purdy soil has. Included soils make up about 25 percent of this map unit.

The available water capacity of this Purdy soil is high. Permeability is slow or very slow. Runoff is slow, and natural fertility is low or medium. A seasonal high water table at or near the surface restricts the root growth of plants. Where unlimed, this soil is strongly or very strongly acid in the surface layer and upper part of the subsoil and very strongly acid to slightly acid in the lower part of the subsoil and in the substratum. The depth to bedrock is more than 60 inches.

If adequately drained, this soil is suited to commonly grown cultivated crops and to hay and pasture, especially to water-tolerant grasses and legumes. It is used mainly for pasture. Draining this soil is difficult, however, because of the clayey texture and the slow or very slow permeability. If the soil is drained, cultivated crops can be grown continuously, but the soil needs the protection of a cover crop. Delaying tillage until the soil is reasonably dry and using crop residue on and in the soil will help to improve fertility and tilth. Proper stocking rates, rotation grazing, and deferred grazing in the spring until the soil is reasonably firm are major pasture management needs.

This soil has very high potential productivity for water tolerant trees, but only a small acreage is wooded. The use of equipment is restricted during wet seasons because the soil is soft.

The seasonal high water table, low strength, and the slow or very slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IVw.

Qu—Quarry, limestone. This unit consists of areas that have been excavated for limestone. It contains limestone fragments and is gently sloping to strongly sloping. The high walls are vertical.

Included with this unit in mapping are areas from which Elliber soils have been excavated as a source of chert fragments for fill material and road construction and maintenance.

This unit is not assigned to a capability subclass.

Rk—Rock outcrop and Rubble land. This unit is gently sloping to very steep. It is on hillsides and ridgetops, mainly in remote areas. The slope of the unit ranges from 3 to 90 percent but is dominantly 35 to 90 percent. The total acreage of this unit is about 50 percent Rock outcrop, 40 percent Rubble land, and 10 percent soils. Some areas are mainly Rock outcrop, some are mainly Rubble land, and some are both. These areas were mapped together because they have no major differences in use.

Rock outcrop consists of exposed, dominantly sandstone bedrock. Rubble land consists of areas where stones and boulders cover more than 90 percent of the surface. The areas have a sparse cover of Virginia pine and scrub oaks.

Included with this unit in mapping are Dekalb, Hazleton, Laidig, Leetonia, and Lehew soils.

The capability subclass is VIIIs.

RuF—Rushtown shaly silt loam, 35 to 65 percent slopes. This soil is very steep and excessively drained. It is mostly on hillsides, mainly on north-facing slopes.

Typically, the surface layer is very dark brown shaly silt loam about 4 inches thick. The subsurface layer is yellowish brown shaly silt loam about 4 inches thick. The subsoil is about 14 inches thick. The upper 9 inches of the subsoil is yellowish brown very shaly silt loam, and the lower 5 inches is strong brown shaly silt loam. The substratum is yellowish brown and brown very shaly silt loam to a depth of 60 inches or more.

Included with this soil in mapping are a few areas of Berks soils, severely eroded soils, moderately steep soils, and steep soils. Included soils make up about 20 percent of this map unit.

The available water capacity of this Rushtown soil is very low to high. Permeability is rapid or very rapid. Runoff is very rapid, and natural fertility is low. This soil is medium acid to very strongly acid. The depth to bedrock is 60 inches or more.

Slope and the rock fragments in the soil make this soil generally unsuited to cultivated crops or hay and difficult to manage for pasture. The soil has moderate potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

Slope is the main limitation of this soil for most urban uses. This soil also has a slip hazard if the base of the slope is excavated. This soil is commonly used as a source of material for road maintenance. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper

surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIe.

ShC—Schaffenaker-Drall stony loamy sands, 3 to 15 percent slopes. This unit consists of strongly sloping or gently sloping, well drained to excessively drained soils on ridgetops and benches. It is mostly in the Wardensville area, on the mountains east of Lost River in Hardy County, and on New Creek Mountain in Grant County. Stones cover 1 to 3 percent of the surface of this unit, and rock outcrops are common. The unit is about 45 percent Schaffenaker soils, 30 percent Drall soils, and 25 percent other soils. These soils are so intermingled that it was not practical to map them separately.

Typically, the surface layer of the Schaffenaker soils is very dark gray loamy sand about 3 inches thick. The subsurface layer is pale brown loamy sand about 3 inches thick. The subsoil is brownish yellow and light yellowish brown loamy sand about 19 inches thick. The substratum is yellowish brown channery sand that extends to bedrock at a depth of about 38 inches.

Typically, the surface layer of the Drall soils is very dark grayish brown loamy sand about 3 inches thick. The subsurface layer is dark yellowish brown channery loamy sand about 3 inches thick. The subsoil is yellowish brown channery loamy sand about 20 inches thick. The substratum is very pale brown and brownish yellow very channery loamy sand that extends to bedrock at a depth of about 47 inches.

Included with these soils in mapping are areas of Allegheny Variant, Dekalb, Ernest Variant, and Hazleton soils. Also included are a few areas of soils with no stones on the surface, soils where stones cover more than 3 percent of the surface, moderately steep soils, and shallow soils.

The available water capacity of these Schaffenaker and Drall soils is very low to moderate. Permeability is rapid or very rapid. Runoff is medium or rapid, and natural fertility is low. These soils are strongly acid to extremely acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Schaffenaker soils. The depth to bedrock ranges from 40 to 80 inches in the Drall soils.

The stones on the surface limit the use of farm machinery and make these soils generally unsuitable for cultivated crops or hay and difficult to manage for pasture. The hazard of erosion is severe in unprotected areas and is a management concern. Proper stocking rates and rotation grazing are the main pasture management needs.

These soils have moderate or moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion.

The slope and depth to bedrock are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

ShE—Schaffenaker-Drall stony loamy sands, 15 to 35 percent slopes. This unit consists of steep or moderately steep, well drained to excessively drained soils on hillsides and benches. It is mostly in the Wardensville area, on the mountains east of Lost River in Hardy County, and on New Creek Mountain in Grant County. Stones cover 1 to 3 percent of the surface of this unit, and rock outcrops are common. This unit is about 40 percent Schaffenaker soils, 35 percent Drall soils, and 25 percent other soils. These soils are so intermingled that it was not practical to map them separately.

Typically, the surface layer of the Schaffenaker soils is very dark gray loamy sand about 3 inches thick. The subsurface layer is pale brown loamy sand about 3 inches thick. The subsoil is brownish yellow and light yellowish brown loamy sand about 19 inches thick. The substratum is yellowish brown channery sand that extends to bedrock at a depth of about 38 inches.

Typically, the surface layer of the Drall soils is very dark grayish brown loamy sand about 2 inches thick. The subsurface layer is dark yellowish brown channery loamy sand about 3 inches thick. The subsoil is yellowish brown channery loamy sand about 20 inches thick. The substratum is very pale brown and brownish yellow very channery loamy sand that extends to bedrock at a depth of about 48 inches.

Included with these soils in mapping are areas of Allegheny Variant, Dekalb, Hazleton, and Murrill soils. Also included are a few areas of soils where stones cover more than 3 percent of the surface, shallow soils, strongly sloping soils, and very steep soils.

The available water capacity of these Schaffenaker and Drall soils is very low to moderate. Permeability is rapid or very rapid. Runoff is rapid or very rapid, and natural fertility is low. These soils are strongly acid to extremely acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Schaffenaker soils. The depth to bedrock ranges from 40 to 80 inches in the Drall soils.

Slope and the stones on the surface restrict the use of farm machinery and make these soils generally unsuited to cultivated crops or hay and difficult to manage for pasture. These soils have low to moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope and depth to bedrock are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

ShF—Schaffenaker-Drall stony loamy sands, 35 to 65 percent slopes. This complex consists of very steep, well drained to excessively drained soils on hillsides. It is mostly in the Wardensville area, on the mountains east of Lost River in Hardy County, and on New Creek Mountain in Grant County. Stones cover 1 to 3 percent of the surface of this unit, and rock outcrops are common. This unit is about 40 percent Schaffenaker soils, 35 percent Drall soils, and 25 percent other soils. These soils are so intermingled that it was not practical to map them separately.

Typically, the surface layer of the Schaffenaker soils is very dark gray loamy sand about 2 inches thick. The subsurface layer is pale brown loamy sand about 2 inches thick. The subsoil is brownish yellow and light yellowish brown loamy sand about 18 inches thick. The substratum is yellowish brown channery sand that extends to bedrock at a depth of about 34 inches.

Typically, the surface layer of the Drall soils is very dark grayish brown channery loamy sand about 2 inches thick. The subsurface layer is dark yellowish brown channery loamy sand about 3 inches thick. The subsoil is yellowish brown channery loamy sand about 20 inches thick. The substratum is very pale brown and brownish yellow very channery loamy sand that extends to bedrock at a depth of about 48 inches.

Included with these soils in mapping are areas of Dekalb, Hazleton, and Murrill soils. Also included are a few areas of soils where stones cover more than 3 percent of the surface, shallow soils, and steep soils.

The available water capacity of these Schaffenaker and Drall soils is very low to moderate. Permeability is rapid or very rapid. Runoff is very rapid, and natural fertility is low. These soils are strongly acid to extremely acid. Root growth is restricted by bedrock at a depth of 20 to 40 inches in the Schaffenaker soils. The depth to bedrock ranges from 40 to 80 inches in the Drall soils.

Slope and the stones on the surface make these soils generally unsuited to cultivated crops, hay, or pasture. The soils have low to moderately high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope and depth to bedrock are the main limitations of these soils for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

SsD—Shouns very stony silt loam, 15 to 35 percent slopes. This soil is moderately steep or steep and is well drained. It is along foot slopes, on benches, and on hillsides. The soil is on the eastern slopes of Allegheny Mountain in Grant County. Stones cover 3 to 15 percent of the surface of this soil.

Typically, the surface layer is very dark grayish brown silt loam about 4 inches thick. The subsoil is 45 inches thick. In sequence downward, it is 8 inches of brown channery silt loam, 10 inches of dark reddish brown channery silt loam, 12 inches of dark reddish brown channery silty clay loam, and 15 inches of dark reddish brown channery clay loam. The substratum is dark reddish brown channery loam to a depth of 60 inches or more.

Included with this soil in mapping are a few areas of Belmont and Calvin high base substratum soils. Also included are a few areas of strongly sloping soils, very steep soils, extremely bouldery soils, soils with no stones on the surface, soils that have more sand than this Shouns soil does, and rock outcrop. Inclusions make up about 25 percent of this map unit.

The available water capacity of this Shouns soil is moderate or high. Permeability is moderate. Runoff is rapid or very rapid, and natural fertility is medium. This soil is medium acid or strongly acid. The depth to bedrock is more than 60 inches.

Slope and the stones on the surface make this soil generally unsuited to cultivated crops or hay and difficult to manage for pasture. Most areas are wooded. The stones restrict the use of farm machinery. The hazard of erosion is severe or very severe in unprotected areas and is a major management concern. Proper stocking rates and rotation grazing are major pasture management needs.

This soil has moderately high potential productivity for trees. Erosion on logging roads and skid trails is the major management concern, and placing the roads and trails on the contour will help to control this erosion. Slope restricts the use of equipment.

The slope and stones are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIIs.

Ta—Tioga fine sandy loam. This soil is nearly level and well drained. It is on flood plains in Hardy County and in the eastern and central parts of Grant County. Slopes range from 0 to 3 percent.

Typically, the surface layer is dark yellowish brown fine sandy loam about 8 inches thick. The subsoil is about 28

inches thick. The upper 5 inches of the subsoil is brown sandy loam. The next 9 inches is dark brown loam. The lower 14 inches is dark brown sandy loam. The substratum is dark yellowish brown sandy loam and very gravelly loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are a few areas of Chagrin, Lindside, and Lobdell soils and soils with a very gravelly subsoil. Included soils make up about 20 percent of this map unit.

The available water capacity of this Tioga soil is moderate or high. Permeability is moderate to moderately rapid. Runoff is slow, and natural fertility is high. This soil is strongly acid to neutral in the surface layer and subsoil and medium acid to neutral in the substratum. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for cultivated crops. They can be grown continuously, but the soil needs the protection of a cover crop. Mixing the residue of the cover crop into the soil helps to improve fertility and tilth. Flooding damages crops in some areas. Proper stocking rates and rotation grazing are the main pasture management needs.

This soil has high potential productivity for trees, but only a few areas are wooded.

A hazard of flooding is the main limitation of this soil for urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control stream scouring and sedimentation.

The capability subclass is IIw.

TgA—Tygart silt loam, 0 to 3 percent slopes. This soil is nearly level and somewhat poorly drained. It is on stream terraces above overflow.

Typically, the surface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is about 32 inches thick. The upper 4 inches of the subsoil is yellowish brown silty clay loam mottled with yellowish red and pale brown. The next 9 inches is pale brown silty clay mottled with yellowish red, grayish brown, and brownish gray. The lower 19 inches is gray silty clay mottled with strong brown and yellowish red. The substratum extends to a depth of 60 inches or more. It is gray silty clay mottled with strong brown and yellowish red.

Included with this soil in mapping are a few areas of Monongahela and Purdy soils. Also included are small areas of soils that contain less clay in the upper part of the subsoil than this Tygart soil has, soils along the Cacapon River that have sandy layers in the subsoil, soils with a strong brown or yellowish red subsoil, soils with a gravelly subsoil and substratum, and soils in Grant County that have bedrock about 3.5 feet below the surface. Included soils make up about 30 percent of this map unit.

The available water capacity of this Tygart soil is moderate or high. Permeability is slow. Runoff is slow, and natural fertility is low. A seasonal high water table at a depth of about 6 inches to 1.5 feet restricts the root growth of plants. Where unlimed, this soil is strongly acid or very strongly acid. The depth to bedrock is more than 60 inches.

If adequately drained, this soil is suited to cultivated crops and to water-tolerant hay and pasture plants. Most areas are used for pasture. Draining the soil is difficult because of the clayey subsoil and the permeability. If the soil is cultivated, using hay in the crop sequence, delaying tillage until the soil is dry, and using crop residue on and in the soil will help to maintain fertility and tilth. Proper stocking rates, rotation grazing, and deferred grazing until the soil is firm are the main pasture management needs.

This soil has high potential productivity for trees, but only a small acreage is wooded. The use of equipment is restricted during wet seasons because the soil is soft.

The seasonal high water table, low strength, and the slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIw.

TgB—Tygart silt loam, 3 to 8 percent slopes. This soil is gently sloping and somewhat poorly drained. It is on stream terraces above overflow.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 33 inches thick. The upper 4 inches of the subsoil is yellowish brown silty clay loam mottled with yellowish red and pale brown. The next 10 inches is pale brown silty clay mottled with yellowish red, grayish brown, and brownish gray. The lower 19 inches is gray silty clay mottled with strong brown and yellowish red. The substratum extends to a depth of 60 inches or more. It is gray silty clay mottled with strong brown and yellowish red.

Included with this soil in mapping are a few areas of Monongahela and Purdy soils. Also included are small areas of soils that are less clayey in the upper part of the subsoil than this Tygart soil, soils along the Cacapon River that have sandy layers in the subsoil, soils with a strong brown or yellowish red subsoil, soils with a gravelly subsoil and substratum, gently sloping soils, strongly sloping soils, and soils in Grant County that have bedrock about 3.5 feet below the surface. Included soils make up about 30 percent of this map unit.

The available water capacity of this Tygart soil is moderate or high. Permeability is slow. Runoff is medium, and natural fertility is low. A seasonal high

water table at a depth of about 6 inches to 1.5 feet restricts the root growth of plants. Where unlimed, this soil is strongly acid or very strongly acid. The depth to bedrock is more than 60 inches.

If adequately drained, this soil is suited to cultivated crops and to water-tolerant hay and pasture plants. Most areas are used for pasture. Draining the soil is difficult because of the clayey subsoil and the permeability. The hazard of erosion is moderate in unprotected areas and is a major management concern. If the soil is cultivated, cultivating on the contour, hay in the crop sequence, and crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates, rotation grazing, and deferred grazing until the soil is firm are the main pasture management needs.

This soil has high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because the soil is soft.

The seasonal high water table, low strength, and the slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIIw.

TvB—Tygart Variant cobbly silt loam, 3 to 8 percent slopes. This soil is gently sloping and moderately well drained. It is mainly in Grant County on stream terraces that are above overflow.

Typically, the surface layer is very dark grayish brown cobbly silt loam about 2 inches thick over yellowish brown gravelly loam about 5 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is 3 inches of strong brown silty clay loam, 9 inches of strong brown silty clay loam mottled with red, 8 inches of red and pinkish gray silty clay, and 13 inches of red, strong brown, and pinkish gray very cobbly silty clay loam. The rest of the subsoil is red, strong brown, and pinkish gray very cobbly silty clay.

Included with this soil in mapping are a few areas of Monongahela and Tygart soils. Also included are nearly level soils, strongly sloping soils, and soils without cobblestones in the surface layer. Included soils make up about 20 percent of this map unit.

The available water capacity of this Tygart Variant soil is moderate or high. Permeability is slow. Runoff is moderate, and natural fertility is low. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. Where unlimed, this soil is strongly acid or very strongly acid. The depth to bedrock is more than 60 inches.

This soil is suited to cultivated crops and to hay and pasture. It is used mainly for pasture. The cobblestones and gravel in the soil interfere with cultivation in some areas. The hazard of erosion is moderate in unprotected areas and is a management concern. If this soil is cultivated, growing crops in contour strips, using hay in the crop sequence, and using crop residue in and on the soil help to control erosion and maintain fertility and tilth. Proper stocking rates, rotation grazing, and deferred grazing in the spring until the soil is firm are major pasture management needs.

This soil has moderately high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because the soil is soft.

The seasonal high water table, the slow permeability, and low strength are the main limitations of the soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help control erosion and sedimentation.

The capability subclass is IIe.

Ud—Udorthents, smoothed. This unit is nearly level to very steep. It consists of areas where the soil has been greatly altered by excavation, grading, or backfilling. Slopes range from 0 to 50 percent. The texture of the soil material in these areas is variable.

Much of this unit consists of excavation sites for dam construction. Also included are excavation sites for industries such as the power plant near Mount Storm, the gas pumping station near Mathias, and large deep-mining operations on the Allegheny Plateau. Small excavations for construction of roads and schools make up the remainder of this unit.

Onsite investigation is necessary to determine the limitations and suitability of the unit for any use. Establishing a plant cover on unprotected areas and providing proper surface-water disposal will help control erosion and sedimentation on this unit.

This unit is not assigned to a capability subclass.

Us—Udorthents, Sandstone and Mudstone, low base. This unit consists mostly of deep, well drained soils in areas that have undergone surface-mining for coal and subsequent reclamation. The unit is on ridgetops and benches on Allegheny Mountain in the western part of Grant County. It consists of gently sloping to strongly sloping benches and moderately steep to very steep highwalls and outslopes.

In a common area on benches these soils have a layer from the surface to a depth of about 4 inches that is dark brown channery loam with yellowish brown mottles. The next 41 inches is very dark grayish brown and dark yellowish brown channery and very channery loam mottled with strong brown, yellowish brown, and brown.

Included with this unit in mapping are a few small areas of medium acid soils, poorly drained soils, and soils with more sand or more clay than these Udorthents have. Included soils make up about 20 percent of this map unit.

The available water capacity and permeability of these Udorthents are variable. Natural fertility is low. Runoff is medium or rapid on the benches and rapid or very rapid on the highwalls and outslopes. Where unlimed, the soils are strongly acid to extremely acid. The hazard of erosion is moderate to very severe in unprotected areas.

The benches have limited suitability for farming. Areas that have been reclaimed recently generally have a good cover of birdsfoot trefoil, tall fescue, or serecia lespedeza. Several of these areas are used for hay or pasture.

This unit has moderate potential productivity for trees. Pines, black locust, and a few other tree species have been planted on some areas.

Onsite investigation and testing are needed to determine limitations and suitability of this unit for urban uses. Establishing a plant cover on unprotected areas, maintaining the existing plant cover, and providing proper surface-water disposal will help to control erosion and sedimentation.

This unit is not assigned to a capability subclass.

WnB—Wharton channery silt loam, 3 to 8 percent slopes. This soil is gently sloping and moderately well drained. It is on broad ridgetops and benches on Allegheny Mountain in the western part of Grant County.

Typically, the surface layer is dark brown channery silt loam about 5 inches thick. The subsoil is strong brown and is about 33 inches thick. The upper 6 inches of the subsoil is channery silt loam. The next 5 inches is silt loam. The lower 22 inches is silty clay loam and channery silty clay loam mottled with pinkish gray and yellowish red. The substratum is strong brown, pinkish gray, and brownish yellow silty clay loam, channery silt loam, and channery silty clay loam. It extends to bedrock at a depth of 58 inches.

Included with this soil in mapping are a few small areas of Gilpin soils. Also included are a few small areas of somewhat poorly drained soils, nearly level soils, strongly sloping soils, and soils with stones on the surface. Included soils make up about 25 percent of this map unit.

The available water capacity of this Wharton soil is moderate or high. Permeability is slow or moderately slow. Runoff is medium, and natural fertility is low. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. Where unlimed, this soil is strongly acid to extremely acid. The depth to bedrock is more than 40 inches.

This soil is suited to cultivated crops and to hay and pasture, but some small wet areas need drainage. It is used mainly for pasture and hay. The hazard of erosion is moderate in cultivated areas and is a management concern. If this soil is cultivated, cultivating on the contour, using hay in the crop sequence, and using crop residue on and in the soil will help to control erosion and maintain fertility and tilth. Proper stocking rates, deferred grazing until the soil is firm, and rotation grazing are the main pasture management needs.

This soil has high potential productivity for trees, but only a small acreage is wooded. Erosion on logging roads and skid trails is a management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because the soil is soft.

The seasonal high water table, low strength, and the slow or moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is IIe.

WoC—Wharton stony silt loam, 3 to 15 percent slopes. This soil is strongly sloping or gently sloping and is moderately well drained. It is on broad ridgetops and benches on Allegheny Mountain in the western part of Grant County. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark gray silt loam about 2 inches thick over dark brown silt loam about 4 inches thick. The subsoil is about 32 inches thick. The upper 6 inches of the subsoil is yellowish brown channery silt loam. The next 5 inches is strong brown silt loam. The lower 21 inches is strong brown silty clay loam and channery silty clay loam mottled with pinkish gray and yellowish red. The substratum is strong brown, pinkish gray, and brownish yellow channery silty clay loam, silty clay loam, and channery silt loam. It extends to bedrock at a depth of about 58 inches.

Included with this soil in mapping are a few small areas of Cavode, Clymer, Gilpin, and Ernest soils. Also included are a few small areas of somewhat poorly drained soils, soils with no stones on the surface, soils where stones cover more than 3 percent of the surface, nearly level soils, and moderately steep soils. Included soils make up about 25 percent of this map unit.

The available water capacity of this Wharton soil is moderate or high. Permeability is slow or moderately slow. Runoff is medium or rapid, and natural fertility is low. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. Where unlimed, this soil is strongly acid to extremely acid. The depth to bedrock is more than 40 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture.

Deferred grazing until the soil is firm, proper stocking rates, and rotation grazing are the main pasture management needs.

This soil has high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because the soil is soft.

The seasonal high water table, low strength, and the slow or moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

WoD—Wharton stony silt loam, 15 to 35 percent slopes. This soil is moderately steep or steep and is moderately well drained. It is on benches and hillsides on Allegheny Mountain in the western part of Grant County. Stones cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark gray silt loam about 2 inches thick over dark brown silt loam about 4 inches thick. The subsoil is about 29 inches thick. The upper 5 inches of the subsoil is yellowish brown channery silt loam. The next 4 inches is strong brown silt loam. The lower 20 inches is strong brown silty clay loam and channery silty clay loam mottled with pinkish gray and yellowish red. The substratum is strong brown, pinkish gray, and brownish yellow channery silty clay loam, silty clay loam, and channery silt loam. It extends to bedrock at a depth of about 55 inches.

Included with this soil in mapping are a few small areas of Clymer, Gilpin, and Ernest soils. Also included are a few small areas of soils with no stones on the surface, soils where stones cover more than 3 percent of the surface, and strongly sloping soils. Included soils make up about 30 percent of this map unit.

The available water capacity of this Wharton soil is moderate or high. Permeability is slow or moderately slow. Runoff is rapid or very rapid, and natural fertility is low. A seasonal high water table about 1.5 to 3 feet below the surface restricts the root growth of some types of plants. Where unlimed, this soil is strongly acid to extremely acid. The depth to bedrock is more than 40 inches.

The stones on the surface limit the use of farm machinery and make this soil generally unsuitable for cultivated crops or hay, but the soil is suited to pasture. Deferred grazing until the soil is firm, proper stocking rates, and rotation grazing are the main pasture management needs.

This soil has high potential productivity for trees, and most areas are wooded. Erosion on logging roads and skid trails is a major management concern, and placing the roads and trails on the contour will help to control this erosion. The use of equipment is restricted during wet seasons because the soil is soft.

The slope, the seasonal high water table, low strength, and the slow or moderately slow permeability are the main limitations of this soil for most urban uses. Maintaining the plant cover on construction sites, establishing a plant cover on unprotected areas, and providing proper surface-water disposal will help to control erosion and sedimentation.

The capability subclass is VIs.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Dixie L. Shreve, resource conservationist, Soil Conservation Service, assisted with the preparation of this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils are identified, the system of land capability classification used by the Soil Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Most of the soils in the survey area have a low or moderate supply of basic plant nutrients. Therefore, the soils respond well to lime, phosphorus, potassium, and nitrogen. The amounts of lime and fertilizers to be applied depend on the type of soil, the cropping history, the type of crop to be grown, the level of desired yield, and an analysis of the soil.

The organic matter content is low in most soils in the survey area. It is important, therefore, to maintain organic matter by adding manure, by using crop residue in and on the soil, and by growing sod crops, cover crops, and green-manure crops.

Runoff from cultivated crops on sloping soils and from overgrazed pastures causes severe erosion in the survey area, especially during periods of intense rainfall on areas of the shaly Berks and Weikert soils (fig. 6). The main management practices that reduce the erosion from cropland are rotation of crops, conservation tillage, using crop residue, growing cover crops, farming on the contour, and using diversion ditches and grassed waterways. The main management practices that reduce erosion from pasture are proper stocking, fertilizing, selecting proper seed mixtures, and rotation grazing.

Periodic flooding causes severe erosion of fertile bottomland soils along streambanks (fig. 7). Stabilizing these soils, mainly by using riprap or a plant cover along the banks of the streams, has been tried on a limited scale in the survey area.

Artificial drainage is needed in the somewhat poorly drained, poorly drained, and very poorly drained soils to make them suitable for cultivated crops, hay, or high-quality pasture. Soils with slow permeability are difficult to drain, and drains need to be more closely spaced than in the more permeable soils. The drains in soils with slow permeability need to be backfilled with porous material to increase the flow rate of water from the soil.

One of the major concerns in producing crops and pasture is the periodic droughtiness in summer that occurs throughout Hardy County and in the eastern three-fourths of Grant County. Irrigation will help to overcome the droughtiness, and a few producers of

Figure 6.—Severe erosion on Berks and Weikert soils.

specialty crops and horticultural crops who have access to large volumes of water have used irrigation in this area. The cost of developing an irrigation system, however, has prevented its widespread use.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties;

Figure 7.—Streambank erosion in an area of fertile soil.

appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally

expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. The levels are defined in the following paragraphs.

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

Class I soils have slight limitations that restrict their use.

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

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

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 very cold or very dry.

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

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

C. Lewis Rowan, woodland conservationist, Soil Conservation Service, assisted with the preparation of this section.

Woodland covers about 541,000 acres, or 80 percent, of the survey area. Much of this acreage is privately owned, and all but 7,200 acres is classified as commercial, or capable of producing at least 20 cubic feet per acre per year of industrial wood in natural stands. The size of the woodland areas range from small farm woodlots to large corporate- or U. S. Forest Service-owned tracts of several thousand acres.

The common forest types, or natural associations of tree species, and their percentage of the wooded area are as follows: oak-hickory, about 61 percent; maple-beech-birch, about 7 percent; other hardwoods, about 20 percent; and pine, about 12 percent (*7*).

Most of the maple-beech-birch type is on the Applachian Plateaus area of western Grant County. Small stands of native red spruce are at higher elevations on the plateau. The other forest types are throughout the survey area. The pine type is mainly on south- and west-facing slopes.

The survey area helps support a sizable pulpwood industry. Most of this pulpwood is eventually marketed in Maryland. Small plantations of commercial Christmas trees are also common in the survey area.

Low or very low available water capacity and low rainfall limit the woodland potential of many soils in the Valley and Ridge part of the survey area. About 35 percent of the acreage in Grant and Hardy Counties has moderately high to very high potential productivity for woodland, and about 65 percent has moderate to very low potential productivity.

Soil properties have a strong influence on suitability for tree species, on tree growth, and on woodland management. Differences in soil depth and in texture, for example, cause differences in the available water capacity, which in turn influences the occurrence of a species and the rate at which a tree grows. Slope, stoniness, rockiness, or a clayey subsoil determine the kind of woodland management. Aspect, or the direction in which a moderately steep, steep, or very steep soil faces, also affects tree growth and management.

The aspect of some soils, generally those that have slopes of more than 15 percent, is shown in table 7. A slope with north aspect is defined as one that faces a compass direction from 315 degrees to 135 degrees. A slope with south aspect is one that faces a compass direction from 135 degrees to 315 degrees. A soil with north aspect generally is more moist than the same soil with south aspect and commonly has a productivity rating that is one number better than that for the south-facing soil. For example, a Belmont soil with north

aspect has an ordination symbol of 2r while the same Belmont soil with south aspect has an ordination symbol of 3r.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; 5, low; and 6, very low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, c, d, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitations* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in 50 years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability. Also listed are other tree species that commonly grow on the soil, regardless of their potential value or growth.

Trees to plant are those that are suited to the soils for commercial wood production or conservation plantings.

Recreation

Grant and Hardy Counties have many areas used for camping, hiking, hunting, fishing, sightseeing, and boating. The main public lands available for recreation are the Monongahela National Forest, the George Washington National Forest, Lost River State Park, Warden Lake Public Fishing Area, and Rockcliff Lake. A small part of the Short Mountain public hunting area is in Hardy County. The South Branch of the Potomac River, the North Fork and South Fork of the South Branch, the Lost River, and the Cacapon River are used for canoeing and boating.

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil

properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Gary A. Gwinn, biologist, Soil Conservation Service, assisted with the preparation of this section.

Grant and Hardy Counties provide a favorable habitat for large populations of native wildlife. Large tracts of woodland provide the habitat elements for numerous white-tailed deer, wild turkey, ruffed grouse, and squirrels. The transitional area between woodland and farmland supports medium-size to large populations of cottontail rabbits and groundhogs and a few bobwhite quail. The soils on flood plains and the nearby streams support mourning doves, woodcocks, and ducks. The main nesting waterfowl species are mallards and wood ducks. Beaver and snowshoe hare inhabit the higher elevations of Allegheny Mountain in the western part of Grant County. The streams, lakes, and farm ponds of the survey area provide habitat for a variety of fish, including smallmouth bass and brook trout.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features

that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, and wild millet.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, birch, cherry, maple, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are silky dogwood, blueberry, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, cedar, and hemlock.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, cattail, reed canarygrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, swamps, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, muskrat, and beaver.

Engineering

James L. Dove, conservation engineer, Soil Conservation Service, assisted with the preparation of this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of

construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost-action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 11 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable

properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil

layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

James L. Dove, conservation engineer, Soil Conservation Service, assisted with the preparation of this section.

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil

and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

Some soils in table 16 are assigned to two hydrologic soil groups. Dual grouping is used for some soils that are less than 20 inches deep to bedrock. The first letter applies to areas where the bedrock is cracked and pervious and the second letter to areas where the bedrock is impervious or where exposed bedrock makes up more than 25 percent of the surface of the soil.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflowing streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

Table 16 gives the frequency and duration of flooding.

Frequency and duration are estimated. Frequency generally is expressed as *none, rare, occasional, common,* or *frequent. None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (there is a near 0 to 5 percent chance of flooding in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (there is a 5 to 50 percent chance of flooding in any year). *Frequent* means that flooding occurs often under normal weather conditions (there is more than a 50 percent chance of flooding in any year). *Common* is used when classification as occasional or frequent does not affect interpretations. Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month).

The information on flooding is based on evidence in the soil profile, namely, thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons, which are characteristic of soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely, grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table and the kind of water table, that is, *perched, artesian,* or *apparent*. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

The two numbers in the "High water table-Depth" column indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that the water table exists for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*6*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udult (*Ud*, meaning humid, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludults (*Hapl*, meaning minimal horizonation, plus *udult*, the suborder of the Ultisols that have a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludults.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*5*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*6*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Allegheny Series

The Allegheny series consists of deep, well drained soils that formed in alluvial material washed from acid soils on uplands. The Allegheny soils are on terraces mainly along the rivers of the survey area. Slopes range from 3 to 25 percent.

Allegheny soils are in the Valley and Ridge province. Mean annual temperature is 51 degrees F, and mean annual precipitation is 34 inches.

Allegheny soils are on the landscape with moderately well drained Monongahela and Monongahela Variant soils, somewhat poorly drained Tygart soils, and poorly

drained or very poorly drained Purdy soils. The Allegheny soils do not have the fragipan characteristic of the Monongahela and Monongahela Variant soils, and they have less clay than the Tygart or Purdy soils.

Typical pedon of Allegheny loam, 3 to 8 percent slopes, in a hayfield about 45 feet north of South Branch River, about 0.25 mile southeast of Grant Memorial Hospital, Grant County:

Ap—0 to 10 inches, dark brown (10YR 4/3) loam; weak medium granular structure; friable; many roots; 5 percent coarse fragments; strongly acid; abrupt smooth boundary.

B21t—10 to 20 inches, brown (7.5YR 5/4) clay loam; few reddish brown (5YR 5/4) mottles; weak fine subangular blocky structure; friable; few discontinuous clay films on faces of peds; common roots; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

B22t—20 to 27 inches, brown (7.5YR 5/4) clay loam; common strong brown (7.5YR 5/6) mottles and few reddish brown (5YR 5/4) mottles; weak fine subangular blocky structure; firm; common discontinuous clay films on faces of peds; few roots; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

B31t—27 to 35 inches, brown (7.5YR 5/4) gravelly clay loam; common strong brown (7.5YR 5/6) mottles and few reddish brown (5YR 5/4) mottles; weak medium platy structure parting to weak fine subangular blocky; firm; common discontinuous clay films on faces of peds; few roots; 30 percent coarse fragments; very strongly acid; gradual wavy boundary.

B32t—35 to 47 inches, strong brown (7.5YR 5/6) gravelly clay loam; few red (2.5YR 4/6) mottles and common pinkish gray (7.5YR 6/2) mottles; weak medium platy structure parting to weak fine subangular blocky; firm; common discontinuous clay films on faces of peds; few roots; 30 percent coarse fragments; very strongly acid; clear wavy boundary.

C—47 to 60 inches, pale brown (10YR 6/3) clay loam; common fine red (2.5YR 4/6) mottles and light brownish gray (10YR 6/2) mottles; massive; friable; few roots; 10 percent coarse fragments; very strongly acid.

The solum thickness ranges from 30 to 55 inches, and the depth to bedrock is more than 60 inches. Coarse fragments of gravel make up 0 to 15 percent of the upper part of the solum and 5 to 35 percent of the lower part of the solum and the C horizon. Some pedons have a IIC horizon that is 35 to 80 percent gravel and cobbles. In unlimed areas the soil is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 2 through 4.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 through 8. The B2 horizon is clay loam, sandy clay loam, loam, silt loam, or silty clay loam. It has weak or moderate, fine or medium, subangular blocky structure and friable or firm consistence. The B3 horizon is fine sandy loam, loam, sandy clay loam, or clay loam or gravelly phases of each. It has weak or moderate, fine or medium, subangular blocky or platy structure and friable to firm consistence. Some pedons do not have a B3 horizon.

The C horizon has hue of 10YR or 7.5YR, value of 4 through 8, and chroma of 2 through 8. It is fine sandy loam, loam, sandy clay loam, or clay loam or gravelly phases of each. It has friable or firm consistence.

Allegheny Variant

The Allegheny Variant consists of deep, well drained soils that formed in colluvial and alluvial material that moved down slope or washed from acid soils on uplands. The Allegheny Variant soils are in coves, on foot slopes, along small drainageways, and on stream terraces, mainly along the Cacapon River watershed and in the mountains east of Lost River. Slopes range from 3 to 15 percent.

Allegheny Variant soils in this survey area are in the Valley and Ridge province. Mean annual temperature is 51 degrees F, and mean annual precipitation is 34 inches.

Allegheny Variant soils are on the landscape with excessively drained Drall soils, well drained Schaffenaker soils, moderately well drained Monongahela Variant soils, and poorly drained or very poorly drained Purdy soils. The Allegheny Variant soils have more clay than the Drall or Schaffenaker soils and fewer coarse fragments than the Drall soils. The Allegheny Variant soils do not have the fragipan characteristic of the Monongahela Variant soils and have less clay than the Purdy soils.

Typical pedon of Allegheny Variant sandy loam, 8 to 15 percent slopes, in a pasture about 100 feet east of woodland, about 650 yards north-northwest of main farm house, on the West Virginia University Reymann Memorial Farm, Wardensville, Hardy County:

Ap1—0 to 3 inches, dark grayish brown (10YR 4/2) sandy loam; weak medium granular structure; very friable; many roots; neutral; clear wavy boundary.

Ap2—3 to 6 inches, yellowish brown (10YR 5/4) sandy loam; weak medium granular structure; very friable; common roots; neutral; clear wavy boundary.

A2—6 to 15 inches, pale brown (10YR 6/3) sandy loam; weak medium granular structure; very friable; common roots; neutral; clear wavy boundary.

B1—15 to 20 inches, yellowish brown (10YR 5/6) sandy loam; weak medium subangular blocky structure; friable; few roots; neutral; gradual wavy boundary.

B2t—20 to 40 inches, yellowish red (5YR 5/6) sandy loam; pockets of loamy sand; weak medium subangular blocky structure; friable; few roots; few discontinuous clay films on faces of peds; medium acid; clear wavy boundary.
C1—40 to 53 inches, very pale brown (10YR 7/4) sand; single grain; loose; strongly acid; abrupt smooth boundary.
C2—53 to 57 inches, pinkish gray (7.5YR 6/2) sandy loam; massive; firm; few strong brown (7.5YR 5/6) horizontal lamellae 1 centimeter thick; strongly acid; gradual wavy boundary.
C3—57 to 63 inches, yellowish red (5YR 4/8) sandy clay loam; massive; firm; strongly acid; clear wavy boundary.

The solum thickness ranges from 30 to 55 inches, and the depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 0 to 15 percent in the upper part of the solum and 0 to 35 percent in the lower part of the solum and in the C horizon. In unlimed areas the soil is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 3 through 6, and chroma of 2 through 4.

The B horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 3 through 6. It is sandy loam, sandy clay loam, or loamy sand and has thin subhorizons of clay loam. The B horizon has very weak to moderate, fine to coarse, subangular blocky structure. Consistence is loose to firm.

The C horizon has hue of 5YR through 10YR, value of 4 through 7, and chroma of 2 through 8. It is sand, loamy sand, sandy loam, or sandy clay loam or their gravelly or channery phases. It has loose to firm consistence.

Basher Series

The Basher series consists of deep, moderately well drained soils that formed in alluvial material washed from acid and lime-influenced soils on uplands. The Basher soils are on flood plains mainly along the smaller streams in the survey area. Slopes ranges from 0 to 3 percent.

Basher soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Basher soils are on the landscape with somewhat excessively drained Potomac soils, well drained Tioga soils, and poorly drained Melvin soils. The Basher soils have fewer coarse fragments than the Potomac soils and contain more sand than the Melvin soils.

Typical pedon of Basher fine sandy loam, in a field about 50 yards northeast of Baker Run, and about 300 yards southeast of the bridge where WV Route 55 crosses Baker Run, Hardy County:

Ap—0 to 11 inches, dark brown (7.5YR 4/2) fine sandy loam; weak medium granular structure; friable; common roots; 1 percent coarse fragments; medium acid; clear wavy boundary.
B1—11 to 17 inches, reddish brown (5YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable; common roots; 1 percent coarse fragments; strongly acid; clear wavy boundary.
B2—17 to 26 inches, reddish brown (5YR 4/4) loam; many fine strong brown (7.5YR 5/6) and few fine gray (7.5YR 6/2) mottles; weak fine subangular blocky structure; friable; common roots; 1 percent coarse fragments; strongly acid; clear wavy boundary.
B3—26 to 42 inches, reddish brown (5YR 5/4) loam; many fine strong brown (7.5YR 5/6) mottles and common medium pinkish gray (7.5YR 6/2) mottles; weak fine and medium subangular blocky structure; friable; few roots; strongly acid; clear wavy boundary.
C1—42 to 49 inches, light brownish gray (10YR 6/2) loamy sand; common fine strong brown (7.5YR 5/6) mottles; single grain; loose; few roots; 5 percent coarse fragments; strongly acid; clear wavy boundary.
IIC2—49 to 60 inches, light brownish gray (10YR 6/2) very gravelly sand; common fine strong brown (7.5YR 5/6) mottles; single grain; loose; 55 percent coarse fragments; strongly acid.

The solum thickness ranges from 20 to 45 inches. The depth to bedrock is more than 60 inches. The content of gravel and cobbles ranges from 0 to 20 percent in the upper part of the solum and 0 to 60 percent in the lower part of the solum and in the C horizon. In unlimed areas the soil is very strongly acid to medium acid in the solum and very strongly acid to slightly acid in the C horizon.

The A horizon has hue of 5YR through 10YR, value of 3 or 4, and chroma of 2 through 4.

The B horizon has hue of 2.5YR through 7.5YR, value of 3 through 5, and chroma of 3 or 4. The B horizon is silt loam, loam, sandy loam, or fine sandy loam or their gravelly phases. It has weak or moderate, fine or medium, subangular blocky structure and friable or very friable consistence.

The C horizon has hue of 5YR through 10YR, value of 3 through 6, and chroma of 2 through 4. It is loam, sandy loam, fine sandy loam, loamy sand, or sand or their gravelly or very gravelly phases. It has loose to friable consistence.

The Basher soils in this survey area are a taxadjunct to the Basher series because they have higher base saturation between depths of 10 and 30 inches than is defined in the range for the Basher series. This difference does not significantly affect the use and management of the soils.

Belmont Series

The Belmont series consists of deep, well drained soils that formed in material weathered from limestone or calcareous shale. The Belmont soils are on benches and hillsides. Slopes range from 15 to 65 percent.

Belmont soils are in Grant County along the eastern edge of Allegheny Mountain. Mean annual precipitation is about 47 inches, and mean annual temperature is about 47 degrees F.

Belmont soils are on the landscape with well drained Calvin high base substratum soils and Shouns soils. The Belmont soils are deeper, have fewer coarse fragments, and contain more clay than the Calvin high base substratum soils. They have more clay and a thinner solum than the Shouns soils.

Typical pedon of Belmont silt loam, in an area of Belmont-Calvin, high base substratum stony silt loams, 15 to 35 percent slopes, in a pasture about 120 yards north of woodland, about 1,000 yards southwest of Route 4/2, about 2.75 miles west of its junction with Route 28/7, Grant County:

Ap—0 to 4 inches, dark brown (7.5YR 3/2) silt loam; weak fine granular structure; friable; many roots; 15 percent coarse fragments; strongly acid; clear wavy boundary.

B1—4 to 9 inches, reddish brown (5YR 4/4) silt loam; weak medium subangular blocky structure; friable; many roots; 5 percent coarse fragments; medium acid; clear wavy boundary.

B21t—9 to 16 inches, dark reddish brown (2.5YR 3/4) silty clay loam; moderate fine subangular blocky structure; friable; common roots; nearly continuous clay films on faces of peds; medium acid; clear wavy boundary.

B22t—16 to 29 inches, dark reddish brown (2.5YR 3/4) silty clay; moderate medium angular blocky structure; friable; few roots; nearly continuous very dusky red (2.5YR 2/2) clay films on faces of peds; medium acid; gradual wavy boundary.

B3t—29 to 43 inches, dark red (2.5YR 3/6) silty clay loam; moderate medium subangular blocky structure; friable; few roots; nearly continuous very dusky red (2.5YR 2/2) clay films on faces of peds; 5 percent coarse fragments; medium acid; gradual wavy boundary.

C—43 to 48 inches, dark red (2.5YR 3/6) silty clay loam; few medium very dusky red (2.5YR 2/2) mottles; massive; friable; few roots; 5 percent coarse fragments; slightly acid; abrupt irregular boundary.

R—48 inches, limestone.

The solum thickness ranges from 24 to 44 inches. The depth to bedrock ranges from 40 to 60 inches. The content of coarse fragments of limestone, shale, and sandstone ranges from 0 to 20 percent in the solum and 5 to 40 percent in the C horizon. In unlimed areas the soil is strongly acid to slightly acid in the uppper part of the solum and medium acid to neutral in the lower part of the solum. The C horizon is medium acid to mildly alkaline.

The A horizon has hue of 7.5YR or 10YR, value of 2 through 5, and chroma of 2 through 4.

The B horizon has hue of 2.5YR to 7.5YR, value of 3 through 5, and chroma of 3 through 6. It is silt loam, silty clay loam, or silty clay. It has moderate to strong, fine to medium, angular blocky or subangular blocky structure. It is friable or firm.

The C horizon has hue of 2.5YR to 7.5YR, value of 3 through 5, and chroma of 3 through 6. It is silty clay loam, clay loam, or silty clay or their channery phases. It is friable or firm.

The Belmont soils in this survey area are a taxadjunct to the Belmont series because they have slightly more clay in the B horizon than defined for the series and the colors are slightly outside the range for the series. These differences do not significantly affect the use and management of the soils.

Berks Series

The Berks series consists of moderately deep, well drained soils that formed in acid material weathered mostly from siltstone and shale and some sandstone. The Berks soils are on ridgetops, benches, and hillsides. Slopes range from 3 to 65 percent.

Berks soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Berks soils are on the landscape with excessively drained Rushtown soils; well drained Calvin, Edom, Mertz, and Weikert soils; moderately well drained Clarksburg and Ernest soils; and Udorthents. The Berks soils are shallower than the Rushtown, Edom, Mertz, Clarksburg, or Ernest soils and are deeper than the Weikert soils or the Udorthents. They do not have the reddish brown characteristics of the Calvin soils, have less clay and more coarse fragments than the Edom soils, and have more coarse fragments than the Clarksburg or Ernest soils and do not have the fragipan characteristic of those soils.

Typical pedon of Berks channery silt loam, 35 to 65 percent slopes, in a wooded area 120 yards south of Route 12, 40 feet north of an old logging road, about 2.5 miles east of the junction of Route 12 and Route 7, Hardy County:

O2—1.5 inches to 0, black (10YR 2/1), partially decomposed roots and leaf litter.

A1—0 to 1 inch, dark brown (10YR 3/3) channery silt loam; moderate fine granular structure; very friable; many roots; 20 percent coarse fragments; strongly acid; abrupt wavy boundary.

A2—1 to 3 inches, grayish brown (10YR 5/2) channery silt loam; weak fine subangular blocky structure parting to moderate fine granular; very friable; many roots; 20 percent coarse fragments; strongly acid; clear wavy boundary.
B21—3 to 8 inches, yellowish brown (10YR 5/6) shaly silt loam; moderate fine subangular blocky structure; friable; many roots; 35 percent coarse fragments; strongly acid; clear wavy boundary.
B22—8 to 14 inches, yellowish brown (10YR 5/6) very shaly silt loam; moderate fine subangular blocky structure; friable; common roots; 50 percent coarse fragments; strongly acid; clear wavy boundary.
B3—14 to 20 inches, yellowish brown (10YR 5/6) very shaly silt loam; weak fine subangular blocky structure nearly obscured by coarse fragments; friable; common roots; 65 percent coarse fragments; strongly acid; gradual wavy boundary.
C—20 to 25 inches, yellowish brown (10YR 5/6)very shaly silt loam; massive; friable; common roots; 80 percent coarse fragments; very strongly acid; clear wavy boundary.
R—25 inches, fractured siltstone and shale.

The solum thickness ranges from 18 to 36 inches, and the depth to bedrock ranges from 20 to 40 inches. Coarse fragments of shale, siltstone, and sandstone make up 15 to 45 percent of the A horizon, 25 to 75 percent of the B horizon, and 50 to 90 percent of the C horizon. In unlimed areas the soil is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 2 through 5, and chroma of 2 through 4. It is channery silt loam or shaly silt loam.

The B horizon has hue mainly of 10YR or 7.5YR, but hue is 5YR in some lower subhorizons. The B horizon has value of 4 or 5 and chroma of 4 through 8. It is shaly, very shaly, channery, or very channery silt loam or loam. The B horizon has weak of moderate, fine or medium, subangular blocky structure and is friable or very friable.

The C horizon has hue of 5YR through 10YR and value and chroma of 4 through 6. It is very shaly or very channery silt loam or very shaly or very channery loam. It is friable or very friable.

Brinkerton Variant

The Brinkerton Variant consists of deep, somewhat poorly or poorly drained soils that formed in lime-influenced material that moved down slope from soils on uplands. The Brinkerton Variant soils are in coves, along foot slopes, and along small drainageways. Slopes range from 3 to 8 percent.

Brinkerton Variant soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Brinkerton Variant soils are on the landscape with moderately well drained Clarksburg and Ernest soils. The Brinkerton Variant soils have more clay than the Clarksburg or Ernest soils and do not have the fragipan characteristic of those soils.

Typical pedon of Brinkerton Variant silt loam, 3 to 8 percent slopes, in pasture about 110 yards north of a log cabin, about 275 yards east of USFS road no.74, about 2.75 miles south of its junction with WV Route 28, Grant County;

Ap—0 to 7 inches, dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many roots; 2 percent coarse fragments; neutral; clear wavy boundary.
B21t—7 to 12 inches, strong brown (7.5YR 5/6) silty clay; many fine gray (N 5/0) and grayish brown (2.5Y 5/2) mottles; weak fine subangular blocky structure; firm; common roots; 2 percent coarse fragments; many discontinuous clay films on faces of peds and in pores; neutral; clear wavy boundary.
B22t—12 to 20 inches, strong brown (7.5YR 5/6) silty clay; many fine gray (N 5/0) and pinkish gray (7.5YR 6/2) mottles and few fine red (10R 4/6) and black (N 2/0) mottles; weak medium subangular blocky structure; firm; few roots; 2 percent coarse fragments; continuous clay films on faces of peds and in pores; medium acid; clear wavy boundary.
B3tg—20 to 42 inches, gray (N 6/0) channery silty clay; many fine strong brown (7.5YR 5/6) mottles and few fine black (N 2/0) and yellowish red (5YR 5/8) mottles; very weak medium subangular blocky structure; firm; few roots; 20 percent coarse fragments; continuous clay films on faces of peds; neutral; gradual wavy boundary.
C1g—42 to 55 inches; gray (N 6/0) silty clay; many fine strong brown (7.5YR 5/6) mottles and few fine yellowish red (5YR 5/8) mottles; massive; firm; few roots; 10 percent coarse fragments; neutral; clear wavy boundary.
C2g—55 to 60 inches, gray (N 6/0) shaly silty clay; many fine grayish brown (2.5Y 5/2), light olive brown (2.5YR 5/4), and yellowish red (5YR 5/8) mottles; massive; firm; few roots; 20 percent coarse fragments; mildly alkaline.

The solum thickness ranges from 30 to 50 inches. The depth to bedrock is more than 5 feet. The content of coarse fragments ranges from 0 to 10 percent in the A horizon and upper part of the B horizon and from 0 to 25 percent in the lower part of the B horizon and in the C horizon. The soils are medium acid to neutral in the solum and medium acid to mildly alkaline in the C horizon.

The A horizon has hue of 10YR, value of 2 through 4, and chroma of 2 or 3.

The B horizon has hue of 7.5YR or 10YR or is neutral. Value is 4 through 7, and chroma is 0 through 6. The B horizon is silty clay loam, silty clay, or clay or their shaly or channery phases. It has weak or moderate, fine or medium, subangular blocky or blocky structure. It is friable to firm.

The C horizon has hue of 7.5YR through 2.5Y or is neutral. Value is 4 through 7, and chroma is 0 through 4. It is silt loam, silty clay loam, silty clay, or clay or their shaly or channery phases. It is friable to firm.

Buchanan Series

The Buchanan series consists of deep, moderately well drained soils that formed in acid colluvial material that moved down slope from soils on uplands. The Buchanan soils are on foot slopes, in coves, and along small drainageways. Slopes range from 3 to 25 percent.

Buchanan soils are in the Valley and Ridge province and on the Appalachian Plateaus. In the Valley and Ridge province, mean annual precipitation is 34 inches and mean annual temperature is 51 degrees F. On the Appalachian Plateaus, mean annual temperature is 47 degrees F and mean annual precipitation is 47 inches.

Buchanan soils are on the landscape with well drained Dekalb, Hazleton, and Laidig soils and moderately well drained Ernest Variant soils. The Buchanan soils have a fragipan, which is not characteristic of the Dekalb, Hazleton, or Ernest Variant soils, and are deeper than the Dekalb soils.

Typical pedon of Buchanan channery loam, in an area of Buchanan stony loam, 3 to 15 percent slopes, in a wooded area about 35 yards west of Route 42/5, about 40 yards northeast of an old logging road, about 1/4 mile north of Lunice Creek, Grant County:

O2—1 inch to 0, partially decomposed leaf litter.

A1—0 to 2 inches, black (10YR 2/1) channery loam; weak medium granular structure; very friable; many roots; 40 percent coarse fragments; strongly acid; clear wavy boundary.

A2—2 to 5 inches, brown (10YR 5/3) channery loam; weak medium granular structure; very friable; many roots; 40 percent coarse fragments; strongly acid; clear wavy boundary.

B1—5 to 10 inches, pale brown (10YR 6/3) channery loam; strong brown (7.5YR 5/6) root strains; weak fine subangular blocky structure; friable; many roots; 35 percent coarse fragments; strongly acid; clear wavy boundary.

B21t—10 to 14 inches, pale brown (10YR 6/3) channery loam; few fine reddish yellow (7.5YR 6/6) mottles; weak medium subangular blocky structure; friable; common roots; few discontinuous clay films on faces of peds and in pores; some clay bridging between sand grains; 25 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—14 to 20 inches, pale brown (10YR 6/3) channery loam; many fine and medium strong brown (7.5YR 5/6) mottles and common fine and medium light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; few roots; few discontinuous clay films on faces of peds and in pores; 25 percent coarse fragments; strongly acid; clear wavy boundary.

Bx1—20 to 30 inches, yellowish brown (10YR 5/4) channery sandy clay loam; light brownish gray (10YR 6/2) prism faces and common fine and medium strong brown (7.5YR 5/8) mottles; weak very coarse prismatic structure parting to weak very coarse platy; very firm and brittle; few roots; few discontinuous clay films on faces of peds and in pores; 25 percent coarse fragments; strongly acid; gradual wavy boundary.

Bx2—30 to 46 inches, yellowish brown (10YR 6/4) channery heavy loam; common fine and medium light brownish gray (10YR 6/2) mottles; weak very coarse prismatic structure parting to weak coarse platy; very firm and brittle; few roots; few discontinuous clay films on faces of peds and in pores; 25 percent coarse fragments; strongly acid; gradual wavy boundary.

C—46 to 60 inches, light yellowish brown (10YR 6/4) very channery sandy clay loam; many fine and medium light brownish gray (10YR 6/2) mottles; massive; firm; 60 percent coarse fragments; strongly acid.

The solum thickness ranges from 40 to 60 inches, and the depth to bedrock is more than 60 inches. The content of coarse fragments of sandstone ranges from 5 to 40 percent in the upper part of the solum and from 10 to 60 percent in the Bx and C horizons. In unlimed areas the soils are extremely acid to strongly acid.

The A horizon has hue of 10YR, value of 2 through 5, and chroma of 1 through 4. It is loam or channery loam.

The B horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 through 6. It is loam, sandy clay loam or clay loam or their channery or very channery phases. The upper part of the B horizon has weak to moderate, fine to medium, subangular blocky structure and friable to firm consistence. The fragipan has very weak to weak, very coarse, prismatic structure parting to weak platy or subangular blocky. It is firm or very firm.

The C horizon has hue of 10YR or 7.5YR and value and chroma of 4 through 6. It is loam, sandy clay loam, sandy loam, or clay loam or their channery or very channery phases. It is friable to firm.

Buchanan Variant

The Buchanan Variant consists of deep, somewhat poorly drained or poorly drained soils that formed mainly in acid colluvial material that moved down slope from

soils on uplands. The Buchanan Variant soils are in coves, on foot slopes, and along small drainageways. Slopes range from 3 to 15 percent.

Buchanan Variant soils are on the Appalachian Plateaus. Mean annual temperature is 47 degrees F, and mean annual precipitation is 47 inches.

Buchanan Variant soils are on the landscape with well drained or excessively drained Leetonia soils, well drained Clymer and Gilpin soils, moderately well drained Wharton soils, and somewhat poorly drained Cavode soils. The Buchanan Variant soils have a fragipan, which is not characteristic of any of those soils, and they have more sand than the Gilpin or Wharton soils, are deeper than the Gilpin soils, and have more sand and less clay than the Cavode soils.

Typical pedon of Buchanan Variant loam, in an area of Buchanan Variant rubbly loam, 3 to 15 percent slopes, about 130 yards east of a surface mine, about 55 yards north of an unimproved road, about 1.6 miles southeast of WV Route 93, at the boundary of Grant and Tucker Counties:

O2—2 inches to 0, partially decomposed roots and leaf litter.

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

A2—2 to 6 inches, grayish brown (10YR 5/2) silt loam; common fine yellowish red (5YR 5/6) mottles; weak medium subangular blocky structure parting to weak medium granular; friable; common roots; 10 percent coarse fragments; very strongly acid; clear wavy boundary.

B21t—6 to 10 inches, strong brown (7.5YR 5/6) sandy clay loam; common fine and medium grayish brown (10YR 5/2)mottles; weak medium subangular blocky structure; friable; common roots; 5 percent coarse fragments; common discontinuous grayish brown (10YR 5/2) clay films on faces of peds; very strongly acid; clear wavy boundary.

B22t—10 to 17 inches, strong brown (7.5YR 5/6) clay loam; common fine and medium grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; few roots; 5 percent coarse fragments; many discontinuous grayish brown (10YR 5/2) clay films on faces of peds; very strongly acid; clear wavy boundary.

Bx1—17 to 24 inches, dark yellowish brown (10YR 4/4) channery loam; moderate very coarse prismatic structure; very firm and brittle; 30 percent coarse fragments; grayish brown (10YR 5/2) prism faces and common black (10YR 2/1) iron and manganese stains; very strongly acid; clear wavy boundary.

Bx2—24 to 32 inches, dark yellowish brown (10YR 4/4) channery loam; many fine and medium grayish brown (10YR 5/2) mottles; many black (10YR 2/1) iron and manganese stains; moderate very coarse prismatic structure; very firm and brittle; 30 percent coarse fragments; grayish brown (10YR 5/2) prism faces; very strongly acid; abrupt wavy boundary.

C—32 to 60 inches, dark brown (10YR 4/3) gravelly loam; few fine and medium grayish brown (10YR 5/2) mottles; massive; very friable; 50 percent coarse fragments; discontinuous 1 inch horizon of gray (10YR 5/1) silty clay loam at 35 inches; very strongly acid.

The solum thickness ranges from 30 to 55 inches. The depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 5 to 40 percent in individual horizons in the upper part of the solum and from 20 to 60 percent in the Bx and C horizons. In unlimed areas the soils are extremely acid to strongly acid.

The A horizon has hue of 10YR, value of 2 through 5, and chroma of 1 through 4.

The B horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 3 through 6. It mainly is loam, clay loam, or sandy clay loam or their channery or very channery phases. Subhorizons of some pedons are sandy loam or silt loam. Above the fragipan, the B horizon has weak or moderate, fine or medium, subangular blocky structure and is friable. In the fragipan, it has weak or moderate, very coarse, prismatic structure and is firm or very firm.

The C horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 2 through 6. It is mottled. It is gravelly, very gravelly, channery, or very channery phases of loam, clay loam, sandy clay loam, or sandy loam. It is very friable to firm.

Calvin Series

The Calvin series consists of moderately deep, well drained soils that formed in acid and lime-influenced material weathered from interbedded shale, siltstone, and sandstone. The Calvin soils are on ridgetops, benches, and hillsides. Slopes range from 8 to 65 percent.

Calvin soils are in the Valley and Ridge province and along the eastern edge of Allegheny Mountain. In the Valley and Ridge province, mean annual precipitation is 34 inches and mean annual temperature is 51 degrees F. At Allegheny Mountain, mean annual precipitation is about 47 inches and mean annual temperature is 47 degrees F.

Calvin soils are on the landscape with well drained Belmont, Berks, Lehew, Shouns, and Weikert soils. The Calvin soils are shallower, have more coarse fragments, and contain less clay than the Belmont soils. They do not have the yellowish brown or strong brown characteristic of the Berks and Weikert soils and are deeper than the Weikert soils. They have more silt and

less sand than the Lehew soils and have more coarse fragments and are shallower than the Shouns soils.

Typical pedon of Calvin channery silt loam, 25 to 35 percent slopes, in a wooded area about 200 yards north of a pond, about 200 feet upslope on the west side of the stream, in Shoemaker Hollow, about 2 miles northwest of WV Route 259, Hardy County:

O2—2 inches to 0, partially decomposed pine needles and leaves.
A1—0 to 2 inches, dark brown (7.5YR 3/2) channery silt loam; moderate medium granular structure; friable; many roots; 15 percent coarse fragments; medium acid; clear wavy boundary.
A2—2 to 7 inches, reddish brown (5YR 4/4) channery silt loam; weak medium platy structure parting to moderate medium granular; friable; many roots; 15 percent coarse fragments; very strongly acid; clear wavy boundary.
B2—7 to 13 inches, reddish brown (5YR 4/4) shaly loam; weak fine subangular blocky structure; friable; common roots; 20 percent coarse fragments; very strongly acid; gradual wavy boundary.
B3—13 to 22 inches, dark reddish brown (2.5YR 3/4) very shaly silt loam; weak fine subangular blocky structure; friable; few roots; 55 percent coarse fragments; very strongly acid; gradual wavy boundary.
C—22 to 38 inches, reddish brown (2.5YR 4/4) very shaly silt loam; massive; friable; few roots; 75 percent coarse fragments; very strongly acid; gradual irregular boundary.
R—38 inches, shale.

The solum thickness ranges from 20 to 35 inches, and the depth to bedrock ranges from 20 to 40 inches. Coarse fragments of shale, siltstone, and sandstone make up 10 to 25 percent in the A horizon, 20 to 55 percent of individual subhorizons of the B horizon, and 50 to 80 percent of the C horizon. In unlimed areas the soil is medium acid to very strongly acid.

The A horizon has hue of 7.5YR or 5YR and value and chroma of 2 through 4. It is channery silt loam or silt loam.

The B horizon has hue of 5YR through 10R, value of 3 through 5, and chroma of 3 through 6. It is shaly, very shaly, channery, or very channery phases of silt loam, loam, or silty clay loam. The B horizon has weak or moderate, fine or medium, subangular blocky structure and is friable.

The C horizon has hue of 10R or 2.5YR, value of 3 or 4, and chroma of 2 through 4. It is very shaly or very channery phases of silt loam or loam. It is friable.

Cavode Series

The Cavode series consists of deep, somewhat poorly drained soils that formed in acid material weathered from shale and some interbedded siltstone and thin sandstone. The Cavode soils are on ridgetops, on benches, and in upland depressions. Slopes range from 3 to 8 percent.

Cavode soils are on the Appalachian Plateaus of Grant County. Mean annual precipitation is 47 inches, and mean annual temperature is 47 degrees F.

Cavode soils are on the landscape with well drained Gilpin soils, moderately well drained Wharton soils, somewhat poorly drained or poorly drained Buchanan Variant soils, and very poorly drained Lickdale soils. The Cavode soils have more clay than the Gilpin, Wharton, or Lickdale soils and are deeper than the Gilpin soils. They have more clay and less sand than the Buchanan Variant soils and do not have the fragipan characteristic of those soils.

Typical pedon of Cavode silt loam, in an area of Cavode stony silt loam, 3 to 8 percent slopes, about 25 yards southeast of Cherry Ridge Road and about 1 mile from its intersection with US Route 50, in Grant County:

A1—0 to 2 inches, very dark gray (10YR 3/1) silt loam; weak medium granular structure; friable; many roots; 5 percent coarse fragments; very strongly acid; abrupt wavy boundary.
A2—2 to 5 inches, brown (10YR 4/3) silt loam; common fine yellowish red (5YR 4/6) and grayish brown (10YR 5/2) mottles; weak medium granular structure; friable; many roots; 5 percent coarse fragments; very strongly acid; clear wavy boundary.
B21t—5 to 11 inches, yellowish brown (10YR 5/6) silty clay loam; common fine and medium light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; firm; common roots; many discontinuous clay films on faces of peds; 10 percent coarse fragments; very strongly acid; clear wavy boundary.
B22tg—11 to 25 inches, light brownish gray (2.5Y 6/2) silty clay; many fine and medium strong brown (7.5YR 5/8) mottles and few fine red (2.5YR 4/8) mottles; moderate fine subangular blocky structure; firm; common roots; continuous clay films on faces of peds; 10 percent coarse fragments; very strongly acid; clear wavy boundary.
B23tg—25 to 39 inches, light brownish gray (2.5Y 6/2) channery silty clay loam; many fine and medium strong brown (7.5YR 5/8) mottles and common fine red (2.5YR 4/8) and black (10YR 2/1) mottles; weak medium subangular blocky structure; firm; few roots; many discontinuous clay films on faces of peds; 20 percent coarse fragments; very strongly acid; clear wavy boundary.
Cg—39 to 60 inches, light brownish gray (2.5Y 6/2) channery silty clay loam; many strong brown (7.5YR 5/8) mottles; massive; firm; 20 percent coarse fragments; very strongly acid.

The solum thickness ranges from 30 to 60 inches. The depth to bedrock is more than 48 inches. Coarse fragments make up 0 to 15 percent of the upper part of the solum and 10 to 40 percent of the B3 and C horizons. In unlimed areas the soil is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 2 through 4, and chroma of 1 through 4.

The upper part of the B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 through 6. The lower part of the B horizon has hue of 10YR through 5Y, value of 5 or 6, and chroma of 1 or 2. The B horizon is silty clay loam, silty clay, or clay. It has weak or moderate, medium, prismatic structure or weak to moderate, fine to medium, subangular or angular blocky structure. It is firm or friable.

The C horizon has hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 1 through 4. It is silty clay loam, silty clay, clay, clay loam, or silt loam or their channery phases. It is friable to firm.

Chagrin Series

The Chagrin series consists of deep, well drained soils that formed in alluvial material washed from lime-influenced soils on uplands. The Chagrin soils are on flood plains. Slopes range from 0 to 3 percent.

Chagrin soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Chagrin soils are on the landscape with somewhat excessively drained Potomac soils, well drained Huntington and Tioga soils, moderately well drained Lindside and Lobdell soils, poorly drained Melvin soils, and very poorly drained or poorly drained Dunning soils. The Chagrin soils have fewer coarse fragments and less sand than the Potomac soils, have more sand and a lighter-colored surface layer than the Huntington soils, contain less sand than the Tioga soils, and contain less clay than the Dunning soils.

Typical pedon of Chagrin loam, in a cultivated field about 250 yards south of the steel bridge on WV Route 259, south of Lost City, about 40 yards east of the Lost River, Hardy County:

Ap—0 to 11 inches, dark brown (10YR 3/3) loam; pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common roots; 1 percent coarse fragments; neutral; clear smooth boundary.

B21—11 to 26 inches, dark brown (7.5YR 4/3) loam; weak medium subangular blocky structure; friable; few roots; 1 percent coarse fragments; slightly acid; gradual wavy boundary.

B22—26 to 38 inches, brown (7.5YR 4/4) loam; weak medium subangular blocky structure; friable; few roots; 1 percent coarse fragments; slightly acid; clear wavy boundary.

C—38 to 60 inches, brown (7.5YR 4/4) fine sandy loam; massive; very friable; few roots; 1 percent coarse fragments; medium acid.

The solum thickness ranges from 24 to 48 inches. The depth to bedrock is more than 60 inches. Coarse fragments of gravel make up 0 to 10 percent in the A horizon and 0 to 15 percent in the B and C horizons. Chagrin soils are medium acid to neutral throughout.

The A horizon has hue of 10YR, value of 2 through 4, and chroma of 2 or 3.

The B horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 3 or 4. It is dominantly loam or silt loam but has thin subhorizons of fine sandy loam or silty clay loam. It has weak, fine to coarse, subangular blocky structure and is friable.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 through 4. It is loam, silt loam, fine sandy loam, or sandy loam. It is friable or very friable.

Clarksburg Series

The Clarksburg series consists of deep, moderately well drained soils that formed in lime-influenced material that moved down slope from soils on uplands. The Clarksburg soils are in coves, along foot slopes, and along drainageways. Slopes range from 3 to 25 percent.

Clarksburg soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Clarksburg soils are on the landscape with well drained Berks, Edom, and Weikert soils; moderately well drained Ernest soils; and somewhat poorly drained or poorly drained Brinkerton Variant soils. The Clarksburg soils have a fragipan, which is not characteristic of the Berks, Edom, or Brinkerton Variant soils, are deeper and have fewer coarse fragments than the Berks or Weikert soils, have less clay than the Edom or Brinkerton Variant soils, and are less acid and have low-chroma mottles lower in the B2t horizon than the Ernest soils.

Typical pedon of Clarksburg silt loam, in an area of Clarksburg stony silt loam, 3 to 15 percent slopes, 1.5 miles south of Mathias, about 430 yards east of the Lost River, in Hardy County:

Ap—0 to 4 inches, very dark grayish brown (10YR 3/2) channery silt loam; moderate fine and medium granular structure; very friable; many roots; 15 percent coarse fragments; slightly acid; abrupt wavy boundary.

B1—4 to 11 inches, yellowish brown (10YR 5/4) channery loam; weak medium subangular blocky structure; friable; many roots; 20 percent coarse fragments; medium acid; gradual wavy boundary.

B21t—11 to 17 inches, yellowish brown (10YR 5/6) channery loam; weak and moderate medium subangular blocky structure; friable; common roots;

common discontinuous clay films on faces of peds; 15 percent coarse fragments; medium acid; gradual wavy boundary.

B22t—17 to 24 inches, brownish yellow (10YR 6/6) clay loam; moderate medium subangular blocky structure; friable; continuous clay films on faces of peds and in pores; common roots; 10 percent coarse fragments; medium acid; clear wavy boundary.

Bx1—24 to 41 inches, light yellowish brown (10YR 6/4) clay loam; common fine and medium yellowish red (5YR 5/6) and pinkish gray (7.5YR 6/2) mottles; weak very coarse prismatic structure parting to moderate fine subangular blocky; very firm and brittle; continuous clay films on faces of peds and in pores; 10 percent coarse fragments; medium acid; clear wavy boundary.

Bx2—41 to 53 inches, yellowish brown (10YR 5/4) clay loam; common fine and medium red (2.5YR 5/8) and pinkish gray (7.5YR 6/2) mottles; weak very coarse prismatic structure parting to moderate fine subangular blocky; very firm and brittle; continuous clay films on faces of peds and in pores; 10 percent coarse fragments; medium acid; gradual wavy boundary.

C—53 to 60 inches, strong brown (7.5YR 5/6) channery silty clay loam; many medium distinct red (2.5YR 5/8) mottles; massive; firm; 30 percent coarse fragments; medium acid.

The solum thickness ranges from 40 to 70 inches. The depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 0 to 20 percent in the horizons above the fragipan, from 5 to 30 percent in the fragipan, and from 5 to 50 percent in the C horizon. In unlimed areas the soil is slightly acid to strongly acid.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 2 or 3.

The B horizon above the fragipan has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 8. It is silty clay loam, silt loam, loam, or clay loam or their channery phases. It has weak or moderate, fine or medium, subangular blocky structure and is friable. The Bx horizon has hue of 5YR through 10YR, value of 4 through 6, and chroma of 3 through 6. It is silt loam, loam, silty clay loam, or clay loam or their channery phases. The Bx horizon has moderate, very coarse, prismatic structure parting to thick to medium, platy or fine to medium, subangular blocky. It is firm or very firm.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 through 8. It is silt loam to clay or their channery phases. It is friable to firm.

Clymer Series

The Clymer series consists of deep, well drained soils that formed in acid material weathered from sandstone, siltstone, and interbedded shale. Clymer soils are on ridgetops, benches, and hillsides. Slopes range from 3 to 35 percent.

Clymer soils are on the Appalachian Plateaus of Grant County. Mean annual precipitation is 47 inches, and mean annual temperature is 47 degrees F.

Clymer soils are on the landscape with well drained or excessively drained Leetonia soils, well drained Gilpin soils, moderately well drained Wharton soils, somewhat poorly drained or poorly drained Buchanan Variant soils, and very poorly drained Lickdale soils. The Clymer soils have more clay and fewer coarse fragments than the Leetonia soils, are deeper than the Gilpin soils, have more sand and less silt than the Gilpin or Wharton soils, and do not have the fragipan characteristic of the Buchanan Variant soils.

Typical pedon of Clymer loam, in an area of Clymer stony loam, 3 to 15 percent slopes, adjacent to a strip mine about 100 yards southeast of Route 42/1, about 2 miles southwest of its junction with WV Route 93, Grant County:

A1—0 to 2 inches, very dark gray (10YR 3/1) loam; weak fine granular structure; very friable; many roots; 5 percent coarse fragments; very strongly acid; abrupt wavy boundary.

A2—2 to 6 inches, brown (7.5YR 4/4) loam; weak fine granular structure; friable; many roots; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

B1—6 to 10 inches, yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure parting to weak medium granular; friable; many roots; 10 percent coarse fragments; very strongly acid; clear wavy boundary.

B21t—10 to 21 inches, yellowish brown (10YR 5/6) channery loam; weak medium subangular blocky structure; friable; many roots; few discontinuous clay films on faces of peds; 25 percent coarse fragments; very strongly acid; clear wavy boundary.

B22t—21 to 33 inches, yellowish brown (10YR 5/6) sandy clay loam; few fine light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/8) mottles; weak coarse platy structure; friable; few roots; few discontinuous clay films on faces of peds; 10 percent coarse fragments; very strongly acid; clear wavy boundary.

B23t—33 to 40 inches, strong brown (7.5YR 5/8) sandy clay loam; pockets of silty clay loam; many fine and medium yellowish brown (10YR 5/4) and common grayish brown (10YR 5/2) mottles; weak medium platy structure; friable; few roots; many discontinuous clay films on faces of peds; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

B24t—40 to 47 inches, yellowish brown (10YR 5/6) channery sandy clay loam; common fine and medium light yellowish brown (10YR 6/4) and

grayish brown (10YR 5/2) lithochromic mottles; weak medium platy structure; friable; few roots; few discontinuous clay films on faces of peds; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

B3t—47 to 53 inches, strong brown (7.5YR 5/6) channery sandy clay loam; few fine brownish yellow (10YR 6/6) mottles; weak fine subangular blocky structure; friable; few clay films on faces of peds; 15 percent coarse fragments; very strongly acid; gradual wavy boundary.

C—53 to 60 inches, yellowish brown (10YR 5/6) channery sandy clay loam; massive; friable; 15 percent coarse fragments; very strongly acid.

The solum thickness ranges from 24 to 55 inches. The depth to bedrock ranges from 42 to 72 inches. Coarse fragments mostly of sandstone make up 5 to 40 percent of the A and B horizons and 15 to 70 percent of the C horizon. In unlimed areas the soil is strongly acid to extremely acid.

The A horizon has hue of 10YR or 7.5YR, value of 2 through 4, and chroma of 1 through 4.

The B horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 4 through 8. It is loam, sandy clay loam, or sandy loam or their channery phases. It mainly has weak or moderate, fine or medium, subangular blocky structure and is friable. Some horizons have platy structure.

The C horizon has hue of 10YR or 7.5YR and value and chroma of 4 through 6. It is channery or very channery loam, sandy loam, or sandy clay loam and is friable or very friable.

Dekalb Series

The Dekalb series consists of moderately deep, well drained soils that formed in acid material weathered mainly from sandstone. The Dekalb soils are on ridgetops, benches, and hillsides. Slopes range from 3 to 65 percent.

Dekalb soils are in the Valley and Ridge province and on the Appalachian Plateaus. In the Ridge and Valley province, mean annual precipitation is 34 inches and mean annual temperature is 51 degrees F. On the Appalachian Plateaus, mean annual precipitation is 47 inches and mean annual temperature is 47 degrees F.

Dekalb soils are on the landscape with excessively drained Drall soils; well drained Elliber, Hazleton, Laidig, Lehew, Murrill, Murrill Variant, Opequon, and Schaffenaker soils; and moderately well drained Buchanan and Ernest Variant soils. The Dekalb soils are shallower than any of those soils except the Lehew and Opequon soils. The Dekalb soils have more coarse fragments than the Laidig or Buchanan soils and do not have the fragipan characteristic of those soils, do not have the reddish brown characteristic of the Lehew soils, have more coarse fragments and less clay than the Murrill or Murrill Variant soils, are deeper and have more coarse fragments and less clay than the Opequon soils, and have more coarse fragments than the Schaffenaker or Ernest Variant soils and more sand than the Ernest Variant soils.

Typical pedon of Dekalb channery loam, in an area of Dekalb, Hazleton and Lehew stony soils, 15 to 35 percent slopes, in a wooded area about 175 yards north of a large power transmission line, about 5.8 miles west of US Route 220 at Old Fields, on the east side of Route 2, Hardy County:

A1—0 to 4 inches, mixed dark grayish brown (10YR 4/2) and black (N 2/0) channery loam; weak fine granular structure; friable; many roots; 40 percent coarse fragments; very strongly acid; abrupt wavy boundary.

A2—4 to 8 inches, yellowish brown (10YR 5/4) channery loam; moderate fine granular structure; friable; many roots; 15 percent coarse fragments; strongly acid; clear wavy boundary.

B21—8 to 13 inches, yellowish brown (10YR 5/4) channery loam; weak and moderate fine subangular blocky structure; friable; many roots; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

B22—13 to 17 inches, yellowish brown (10YR 5/6) very channery loam; weak and moderate fine subangular blocky structure; friable; common roots; 50 percent coarse fragments; strongly acid; clear wavy boundary.

B3—17 to 23 inches, yellowish brown (10YR 5/4) very channery loam; weak fine subangular blocky structure; friable; common roots; 60 percent coarse fragments; strongly acid; abrupt wavy boundary.

R—23 inches, fractured sandstone.

The solum thickness and depth to bedrock range from 20 to 40 inches. Coarse fragments mainly of sandstone and in some areas siltstone or chert make up 10 to 60 percent of the solum and 50 to 80 percent of the C horizon. In unlimed areas the soil is extremely acid to strongly acid.

The A horizon is neutral or has hue of 10YR, value of 2 through 5, and chroma of 0 through 4. It is channery, stony, or very stony phases of sandy loam or loam.

The B horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 through 8. It is channery or very channery phases of loam, fine sandy loam, or sandy loam. It has weak or moderate, fine or medium, subangular blocky structure and is friable.

The C horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 through 6. It is very channery phases of sandy loam or loamy sand. It is friable to loose.

Drall Series

The Drall series consists of deep, excessively drained soils that formed in acid material weathered from sandstone. The Drall soils are on ridgetops, benches, and hillsides. Slopes range from 3 to 65 percent.

Drall soils are in the Ridge and Valley province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Drall soils are on the landscape with well drained Allegheny Variant, Dekalb, and Hazleton soils and are mapped only with well drained Schaffenaker soils. The Drall soils have less clay and more coarse fragments than the Allegheny Variant soils, are deeper than the Dekalb or Schaffenaker soils, and have more coarse fragments than the Schaffenaker soils.

Typical pedon of Drall channery loamy sand, in an area of Schaffenaker-Drall stony loamy sands, 15 to 35 percent slopes, in a wooded area on Sandy Ridge along USFS Route 344, about 3.35 miles from its junction with WV Route 55, in Hardy County:

A1—0 to 2 inches, very dark grayish brown (10YR 3/2) channery loamy sand; many white sand grains; weak medium granular structure; very friable; many roots; 20 percent coarse fragments; very strongly acid; abrupt wavy boundary.

A2—2 to 5 inches, dark yellowish brown (10YR 4/4) channery loamy sand; weak medium granular structure; very friable; many roots; 20 percent coarse fragments; extremely acid; clear wavy boundary.

B1—5 to 14 inches, yellowish brown (10YR 5/6) channery loamy sand; weak medium subangular blocky structure; very friable; many roots; 30 percent coarse fragments; very strongly acid; clear wavy boundary.

B2—14 to 25 inches, yellowish brown (10YR 5/4) channery loamy sand; weak fine and medium subangular blocky structure; very friable; many roots; 40 percent coarse fragments; very strongly acid; clear wavy boundary.

C1—25 to 37 inches, very pale brown (10YR 7/4) very channery loamy sand; single grain; loose; few roots; 60 percent coarse fragments; very strongly acid; clear wavy boundary.

C2—37 to 48 inches, brownish yellow (10YR 6/6) very channery loamy sand; massive; very friable; few roots; 60 percent coarse fragments; very strongly acid.

R—48 inches, hard sandstone.

The solum thickness ranges from 20 to 40 inches, and the depth to bedrock is 40 to 80 inches. Coarse fragments mainly of sandstone make up 20 to 55 percent of the A horizon and 40 to 80 percent of the B and C horizons. In unlimed areas the soil is strongly acid to extremely acid.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 1 through 4.

The B horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 4 through 8. It is channery or very channery phases of loamy sand, loamy fine sand, or sand. It has very weak, subangular blocky or weak, fine and medium, granular structure and is very friable, or it is single grain and loose.

The C horizon has hue of 10YR or 7.5YR, value of 5 through 7, and chroma of 4 through 8. It is sand or loamy sand or their channery or very channery phases.

Dunning Series

The Dunning series consists of deep, very poorly or poorly drained soils that formed in alluvial material washed from lime-influenced soils on uplands. The Dunning soils are on flood plains. Slopes range from 0 to 3 percent.

Dunning soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Dunning soils are on the landscape with well drained Chagrin, Huntington, and Tioga soils; moderately well drained or well drained Massanetta soils; moderately well drained Lindside and Lobdell soils; and poorly drained Melvin soils. Dunning soils have more clay than any of those soils and do not have the marl substratum characteristic of the Massanetta soils.

Typical pedon of Dunning silty clay loam, about 75 yards east of Route 28/2, and about 0.35 mile north of its junction with WV Route 28, Grant County:

Ap—0 to 6 inches, very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; many roots; mildly alkaline; clear wavy boundary.

A1—6 to 22 inches, black (N 2/0) silty clay loam, dark gray (N 4/0) dry; moderate fine subangular blocky structure; friable; many roots; neutral; clear wavy boundary.

B2g—22 to 45 inches, gray (N 5/0) silty clay; many medium strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium blocky; firm; few roots; neutral; clear wavy boundary.

Cg—45 to 60 inches, dark gray (N 4/0) silty clay; many medium strong brown (7.5YR 5/6) mottles; massive; friable; mildly alkaline.

The solum thickness ranges from 30 to 50 inches. The depth to bedrock is more than 60 inches. Reaction is medium acid to mildly alkaline throughout.

The A horizon has hue of 10YR or is neutral, has value of 2 or 3, and has chroma of 0 through 2.

The B horizon has hue of 10YR or is neutral, has value of 4 through 6, and has chroma of 0 or 1. It is silty

clay loam, silty clay, sandy clay, or clay. It has moderate, medium, prismatic structure parting to moderate, medium, blocky, or it has weak, fine, platy structure and is firm or friable.

The C horizon has hue of 10YR or is neutral, has value of 4 or 5, and has chroma of 0 or 1. It mainly is silty clay loam, silty clay, sandy clay, or clay and is friable or firm. Some pedons have stratified layers of silt loam, loam, or sandy loam below a depth of 40 inches.

Edom Series

The Edom series consists of deep, well drained soils that formed in material weathered from calcareous shale or limestone. The Edom soils are on ridges, benches, and hillsides. Slopes range from 8 to 65 percent.

Edom soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Edom soils are on the landscape with well drained Berks, Opequon, and Weikert soils and moderately well drained Clarksburg soils. The Edom soils are deeper and have more clay and fewer coarse fragments than the Berks or Weikert soils, are deeper than the Opequon soils, have more clay than the Clarksburg soils, and do not have the fragipan characteristic of the Clarksburg soils.

Typical pedon of Edom silt loam, 8 to 15 percent slopes, in a pasture about 16 yards west of Route 2, 1.6 miles west of Old Fields, Hardy County:

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

B1—4 to 8 inches, strong brown (7.5YR 5/6) silt loam; weak fine subangular blocky structure; friable; common roots; strongly acid; clear wavy boundary.

B21t—8 to 15 inches, yellowish red (5YR 4/6) silty clay loam; weak to moderate fine subangular blocky structure; friable; common roots; few strong brown (7.5YR 5/6) clay films on faces of peds; medium acid; gradual wavy boundary.

B22t—15 to 23 inches, red (2.5YR 4/8) silty clay; moderate fine blocky structure; friable; common roots; continuous clay films on faces of peds; slightly acid; clear wavy boundary.

B23t—23 to 27 inches, dark brown (7.5YR 4/4) silty clay; pockets of red (2.5YR 4/6) silty clay; moderate fine blocky structure; friable; few roots; many discontinuous clay films on faces of peds; neutral; clear wavy boundary.

B3t—27 to 33 inches, mixed dark brown (10YR 4/3), red (2.5YR 4/8), and reddish brown (2.5YR 5/4) silty clay loam; moderate fine blocky structure; friable; few roots; many discontinuous clay films on faces of peds; 5 percent coarse fragments; neutral; clear wavy boundary.

C—33 to 42 inches, mixed dark grayish brown (10YR 4/2) and yellowish red (5YR 4/6) shaly silty clay loam; massive; friable; 50 percent coarse fragments; mildly alkaline; abrupt smooth boundary.

R—42 inches, limestone.

The solum thickness ranges from 20 to 40 inches. The depth to bedrock ranges from 40 to 60 inches. The content of coarse fragments of limestone and shale ranges from 0 to 30 percent in the solum and 20 to 80 percent in the C horizon. The soils range from strongly acid to neutral in the upper part of the solum and from medium acid to mildly alkaline in the lower part of the solum and in the C horizon.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 through 4. It is silt loam or channery silt loam.

The B horizon has hue of 2.5YR through 7.5YR, value of 4 or 5, and chroma of 3 through 6. It is silty clay, clay, or silty clay loam or their shaly phases. It has weak to strong, fine or medium, subangular blocky or blocky structure. It is friable or firm.

The C horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 2 through 6. It is silty clay loam, silty clay, or clay or their shaly or very shaly phases. It is friable to firm.

Elliber Series

The Elliber series consists of deep, well drained soils that formed in material weathered from cherty limestone. The Elliber soils are on ridgetops, benches, and hillsides. Slopes range from 8 to 65 percent.

Elliber soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Elliber soils are on the landscape with well drained Dekalb, Hazleton, Murrill, Mertz, and Opequon soils. The Elliber soils are deeper than the Dekalb or Opequon soils, have more coarse fragments and less clay than the Opequon soils, do not have the sandstone fragments typical of the Hazleton soils, have less clay than the Mertz soils, have more coarse fragments than the Murrill soils, and contain less clay in the lower part of the solum than those soils.

Typical pedon of Elliber very cherty loam, 35 to 65 percent slopes, on Patterson Creek Mountain in a cut south of Route 10/5, about 400 feet below sharp curve, about 2.9 miles west of Walnut Bottom, Hardy County:

O1—1 inch to 0, partially decomposed leaves and twigs.

A1—0 to 4 inches, black (10YR 2/1) very cherty loam; weak medium granular structure; very friable; many roots; 70 percent coarse fragments; very strongly acid; clear wavy boundary.

A21—4 to 11 inches, pale brown (10YR 6/3) very cherty loam; weak fine granular structure; loose; many

roots; 80 percent coarse fragments; very strongly acid; clear wavy boundary.

A22—11 to 16 inches, pale brown (10YR 6/3) very cherty loam; weak medium granular structure; very friable; many roots; 70 percent coarse fragments; very strongly acid; gradual wavy boundary.

B1—16 to 22 inches, pale brown (10YR 6/3) very cherty loam; weak fine subangular blocky structure parting to weak medium granular; very friable; many roots; 70 percent coarse fragments; very strongly acid; gradual wavy boundary.

B21—22 to 29 inches, light yellowish brown (10YR 6/4) very cherty sandy loam; weak medium granular structure; very friable; many roots; 65 percent coarse fragments; very strongly acid; clear wavy boundary.

B22t—29 to 45 inches, brownish yellow (10YR 6/6) very cherty loam; weak fine subangular blocky structure; friable and firm; common roots; few discontinuous clay and silt coatings in pores and on faces of peds; 60 percent coarse fragments; very strongly acid; clear wavy boundary.

C1—45 to 51 inches, brownish yellow (10YR 6/6) very cherty loam; massive; very friable; few roots; silt coatings on fragments; 75 percent coarse fragments; very strongly acid; clear wavy boundary.

C2—51 to 60 inches, brownish yellow (10YR 6/6) very cherty loam; single grain; loose; 80 percent coarse fragments; strongly acid.

The solum thickness ranges from 40 to 80 inches. The depth to bedrock is more than 60 inches. The content of coarse fragments, primarily chert but some sandstone, is 40 to 80 percent. In unlimed areas the soil is extremely acid to strongly acid.

The A horizon has hue of 10YR, value of 2 through 7, and chroma of 1 through 4.

The B horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 through 8. It is dominantly cherty or very cherty phases of loam or silt loam, but individual horizons are very cherty sandy loam or cherty sandy loam. Consistence is loose to firm.

The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 through 6. It is very cherty phases of loam, silt loam, or sandy loam and is loose to firm.

Ernest Series

The Ernest series consists of deep, moderately well drained soils that formed in acid colluvial material that moved down slope from soils on uplands. Ernest soils are on foot slopes, in coves, and along drainageways. Slopes range from 3 to 25 percent.

Ernest soils are in the Valley and Ridge province and on the Appalachian Plateaus. In the Valley and Ridge province, mean annual temperature is 51 degrees F and mean annual precipitaton is 34 inches. On the Appalachian Plateaus, mean annual temperature is 47 degrees F and mean annual precipitation is 47 inches.

Ernest soils are on the landscape with well drained Berks and Weikert soils, moderately well drained Clarksburg and Monongahela soils, and somewhat poorly drained or poorly drained Brinkerton Variant soils. The Ernest soils are deeper and have fewer coarse fragments than the Berks or Weikert soils; have a fragipan, which is not characteristic of the Berks, Weikert, or Brinkerton Variant soils; have less clay than the Brinkerton Variant soils; have low-chroma mottles higher in the B2t horizon than the Clarksburg or Monongahela soils; and are more acid than the Clarksburg soils.

Typical pedon of Ernest silt loam, 3 to 8 percent slopes, in a pasture along a farm lane about 100 yards east of a gate, about 0.6 mile west of Warden Lake Road, about 1.4 miles along Warden Lake Road from its junction with WV Route 259, Hardy County:

Ap—0 to 10 inches, dark brown (10YR 4/3) silt loam; weak medium granular structure; friable; many roots; 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

B1—10 to 17 inches, yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; common roots; 5 percent coarse fragments; slightly acid; gradual wavy boundary.

B21t—17 to 22 inches, yellowish brown (10YR 5/6) silty clay loam; few fine and medium light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common roots; few discontinuous clay films on faces of peds; 5 percent coarse fragments; medium acid; clear wavy boundary.

B22t—22 to 26 inches, yellowish brown (10YR 5/6) silty clay loam; common fine light brownish gray (10YR 6/2) mottles and few medium strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; few roots; few discontinuous clay films on faces of peds; 5 percent coarse fragments; strongly acid; clear wavy boundary.

Bx—26 to 39 inches, yellowish brown (10YR 5/4) silty clay loam; common fine light brownish gray (10YR 6/2) mottles and faces of peds; common fine yellowish red (5YR 4/6) mottles; common black (10YR 2/1) coatings; weak very coarse prismatic structure parting to moderate coarse platy; very firm and brittle; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

C1—39 to 51 inches, mixed strong brown (7.5YR 5/6), pinkish gray (7.5YR 6/2), and yellowish red (5YR 5/6) shaly silty clay loam; common black coatings; very weak medium platy structure; friable to firm; 15 percent coarse fragments; very strongly acid; clear wavy boundary.

C2—51 to 60 inches, mixed strong brown (7.5YR 5/6), light brownish gray (10YR 6/2), and yellowish brown (10YR 5/6) shaly silty clay loam; common black coatings; massive; friable; 35 percent coarse fragments; very strongly acid.

The solum thickness ranges from 36 to 60 inches. The depth to bedrock is generally more than 60 inches. The content of coarse fragments, mainly of shale and siltstone, ranges from 0 to 15 percent in the A horizon, 5 to 25 percent in the B horizon, and 5 to 40 percent in the C horizon. In unlimed areas the soil is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 2 through 5, and chroma of 1 through 4.

The B horizon above the fragipan has hue of 10YR or 7.5YR and value and chroma of 4 through 6. It is silt loam or silty clay loam or their shaly or channery phases. It has weak or moderate, fine or medium, subangular blocky structure and is friable. The Bx horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 2 through 6. It is silt loam, silty clay loam, clay loam, or loam or their shaly or channery phases. It has weak, very coarse, prismatic structure parting to weak or moderate, fine to coarse, subangular blocky or platy. The Bx horizon is firm or very firm.

The C horizon has hue of 7.5YR to 2.5Y, value of 4 through 7, and chroma of 2 through 6. It is silt loam, silty clay loam, loam, clay loam, or silty clay or their shaly or channery phases. It is friable to firm.

Ernest Variant

The Ernest Variant consists of deep, moderately well drained soils that formed in acid colluvial material which overlies a 1- to 3-foot-thick layer of acid, clayey residuum weathered from shale. The colluvial material moved down slope from soils on uplands. The Ernest Variant soils are on foot slopes and benches. Slopes range from 3 to 25 percent.

Ernest Variant soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Ernest Variant soils are on the landscape with well drained Dekalb, Hazleton, and Laidig soils and moderately well drained Buchanan soils. The Ernest Variant soils have fewer coarse fragments and less sand than the Dekalb or Hazleton soils, are deeper than the Dekalb soils, and do not have the fragipan characteristic of the Laidig and Buchanan soils.

Typical pedon of Ernest Variant channery loam, in an area of Ernest Variant stony loam, 3 to 15 percent slopes, near the community of Falls, 1 mile south of the junction of Routes 3 and 3/3, Grant County:

A1—0 to 2 inches, very dark grayish brown (10YR 3/2) channery loam; weak fine granular structure; very friable; many roots; 20 percent coarse fragments; very strongly acid; abrupt wavy boundary.

A2—2 to 5 inches, yellowish brown (10YR 5/4) channery loam; moderate fine and medium granular structure; very friable; many roots; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

B1—5 to 10 inches, yellowish brown (10YR 5/4) channery loam; weak fine subangular blocky structure; friable; many roots; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

B21t—10 to 16 inches, yellowish brown (10YR 5/6) channery silt loam; weak fine and medium subangular blocky structure; friable; many roots; few discontinuous clay films on faces of peds; 25 percent coarse fragments; very strongly acid; clear wavy boundary.

B22t—16 to 23 inches, strong brown (7.5YR 5/6) channery silty clay loam; weak and moderate medium subangular blocky structure; friable; common roots; few discontinuous clay films on faces of peds; 25 percent coarse fragments; very strongly acid; clear wavy boundary.

B23t—23 to 31 inches, strong brown (7.5YR 5/6) channery silty clay loam; few medium gray (10YR 6/1) and yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; friable; common roots; common discontinuous clay films on faces of peds; 20 percent coarse fragments; very strongly acid; abrupt wavy boundary.

IIB3t—31 to 46 inches, strong brown (7.5YR 5/6) silty clay; few medium yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; firm; few roots; continuous gray (10YR 6/1) clay films on faces of peds; 5 percent coarse fragments in upper few inches; very strongly acid; clear wavy boundary.

IIC—46 to 52 inches, strong brown (7.5YR 5/6) and gray (10YR 6/1) very shaly silty clay loam; massive; firm; 75 percent coarse fragments; very strongly acid; abrupt wavy boundary.

R—52 inches, shale.

The solum thickness ranges from 20 to 50 inches. The depth to bedrock is more than 48 inches. The content of coarse fragments mostly of sandstone ranges from 10 to 50 percent in the upper part of the solum, and coarse fragments mostly of shale make up 5 to 75 percent of the lower part of the solum and the C horizon. In unlimed areas the soil is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 2 through 5, and chroma of 2 through 4.

The B horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 3 through 6. The upper part of the B horizon is silt loam, loam, or silty clay loam or their channery phases. The lower part of the B horizon is generally silty clay or clay or their shaly or very shaly phases. The B horizon has weak or moderate, fine and

medium, subangular blocky structure and is friable or firm.

The C horizon has hue of 7.5YR through 2.5Y, value of 5 or 6, and chroma of 1 to 6. It is silty clay, clay, or silty clay loam or their shaly or very shaly phases. Consistence is friable to firm.

Gilpin Series

The Gilpin series consists of moderately deep, well drained soils that formed in acid material weathered from siltstone, shale, and sandstone. The Gilpin soils are on ridgetops, benches, and sideslopes. Slopes range from 3 to 65 percent.

Gilpin soils are in the Valley and Ridge province and on the Appalachian Plateaus. In the Valley and Ridge province, mean annual precipitation is 34 inches and mean annual temperature is 47 degrees F. On the Appalachian Plateaus, mean annual precipitation is 47 inches and mean annual temperature is 47 degrees.

Gilpin soils are on the landscape with well drained Clymer soils, moderately well drained Wharton soils, somewhat poorly drained Cavode soils, and somewhat poorly drained or poorly drained Buchanan Variant soils. The Gilpin soils are shallower than any of those soils, have more silt and less sand than the Clymer soils, have less sand than and do not have the fragipan characteristic of the Buchanan Variant soils, and have less clay than the Cavode soils.

Typical pedon of Gilpin channery silt loam, in an area of Gilpin stony silt loam, 3 to 15 percent slopes, in a wooded area in Grant County about 300 yards east of a strip mine, about 1.3 miles south of the intersection of WV Route 93 and the Tucker County line:

O1—1 inch to 0, partially decomposed leaves and twigs.
A1—0 to 1 inch, black (10YR 2/1) channery silt loam; weak medium granular structure; friable; many roots; 15 percent coarse fragments; very strongly acid; abrupt wavy boundary.
A2—1 to 5 inches, yellowish brown (10YR 5/4) channery silt loam; weak fine subangular blocky structure parting to weak medium granular; friable; many roots; 20 percent coarse fragments; very strongly acid; clear wavy boundary.
B21t—5 to 13 inches, strong brown (7.5YR 5/6) channery silt loam; weak fine subangular blocky structure; friable; few discontinuous clay films on faces of peds; many roots; 25 percent coarse fragments; very strongly acid; clear wavy boundary.
B22t—13 to 20 inches, strong brown (7.5YR 5/6) channery silt loam; moderate fine subangular blocky structure; friable; common discontinuous clay films on faces of peds; common roots; 25 percent coarse fragments; very strongly acid; clear wavy boundary.
B23t—20 to 29 inches, strong brown (7.5YR 5/6) channery silt loam; weak medium subangular blocky structure; friable; few discontinuous clay films on faces of peds; common roots; 35 percent coarse fragments; very strongly acid; clear wavy boundary.
C—29 to 35 inches, strong brown (7.5YR 5/6) very channery light silty clay loam; few fine yellowish red (5YR 5/8) and light brownish gray (10YR 6/2) lithochromic mottles; common black coatings; massive; firm; few roots; 75 percent coarse fragments; very strongly acid; clear wavy boundary.
R—35 inches, hard platy sandstone and siltstone.

The solum thickness ranges from 20 to 36 inches, and the depth to bedrock ranges from 20 to 40 inches. Coarse fragments of shale, siltstone, and sandstone make up 5 to 40 percent of the solum and 30 to 80 percent of the C horizon. In unlimed areas the soil is strongly acid to extremely acid.

The A horizon has hue of 10YR, value of 2 through 5, and chroma of 1 through 4. It is silt loam, stony silt loam, or channery silt loam.

The B horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 through 8. It is loam, silt loam, or silty clay loam or their channery or shaly phases. The B horizon has weak or moderate, fine or medium, subangular blocky structure and is friable or firm.

The C horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 through 8. It is shaly, very shaly, channery, or very channery phases of silt loam, loam, or silty clay loam. It is friable or firm.

Hazleton Series

The Hazleton series consists of deep, well drained soils that formed in acid material weathered mostly from sandstone. The Hazleton soils are on ridgetops, benches and hillsides. Slopes range from 3 to 65 percent.

Hazleton soils are in the Valley and Ridge province and on the Appalachian Plateaus. In the Ridge and Valley province, mean annual precipitation is 34 inches and mean annual temperature is 51 degrees F. On the Appalachian Plateaus, mean annual precipitation is 47 inches and mean annual temperature is 47 degrees F.

Hazleton soils are on the landscape with excessively drained Drall soils; well drained Dekalb, Elliber, Laidig, Lehew, Murrill, Murrill Variant, Opequon, and Schaffenaker soils; and moderately well drained Buchanan and Ernest Variant soils. The Hazleton soils are deeper than the Dekalb, Lehew, Opequon, or Schaffenaker soils; do not have the chert fragments characteristic of the Elliber soils; have more coarse fragments than the Laidig or Buchanan soils and do not have the fragipan characteristic of those soils; have more coarse fragments and less clay than the Murrill, Murrill Variant, or Opequon soils; and have more sand and more coarse fragments than the Ernest Variant soils.

Typical pedon of Hazleton channery fine sandy loam, in an area of Dekalb, Hazleton, and Lehew stony soils,

15 to 35 percent slopes, in a wooded area about 3.6 miles north of Kessel, on the east bank of Route 10/3, in a sharp curve about 0.1 mile west of a ridgetop, Hardy County:

O2—1 inch to 0, partially decayed leaves and twigs.
A1—0 to 2 inches, black (10YR 2/1) channery fine sandy loam; moderate very fine granular structure; very friable; many roots; 20 percent coarse fragments; strongly acid; clear wavy boundary.
A2—2 to 6 inches, brown (10YR 5/3) channery fine sandy loam; weak fine subangular blocky structure parting to moderate fine granular; very friable; many roots; 20 percent coarse fragments; strongly acid; clear wavy boundary.
B1—6 to 11 inches, yellowish brown (10YR 5/4) channery fine sandy loam; weak medium subangular blocky structure; friable; many roots; 15 percent coarse fragments; strongly acid; clear wavy boundary.
B21—11 to 17 inches, yellowish brown (10YR 5/4) channery loam; moderate medium subangular blocky structure; friable; many roots; 35 percent coarse fragments; strongly acid; clear wavy boundary.
B22—17 to 24 inches, yellowish brown (10YR 5/6) channery loam; moderate medium subangular blocky structure; friable; many roots; 40 percent coarse fragments; strongly acid; clear wavy boundary.
B3—24 to 32 inches, yellowish brown (10YR 5/6) very channery sandy loam with pockets of brown or dark brown (7.5YR 4/4) very channery loam; weak medium subangular blocky structure; friable; common roots; 50 percent coarse fragments; strongly acid; gradual wavy boundary.
C—32 to 60 inches, yellowish brown (10YR 5/6) very channery loamy sand with pockets of brown or dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6) very channery sandy loam; massive; friable; common roots; 75 percent coarse fragments; strongly acid.

The solum thickness ranges from 25 to 50 inches. Depth to bedrock is more than 40 inches. The content of coarse fragments of sandstone and occasionally siltstone or chert ranges from 15 to 70 percent in the solum and from 35 to 80 percent in the C horizon. In unlimed areas the soils are strongly acid to extremely acid.

The A horizon has hue of 10YR, value of 2 through 5, and chroma of 1 through 4. It is stony fine sandy loam or very stony fine sandy loam.

The B horizon has hue of 10YR or 7.5YR and has value and chroma of 3 through 6. It is channery or very channery phases of sandy loam or loam. It has weak or moderate, fine or medium, subangular blocky structure with very friable to firm consistence.

The C horizon has hue of 10YR through 5YR, value of 3 through 6, and chroma of 2 through 6. It is channery or very channery phases of sandy loam, loam, fine sandy loam or loamy sand. It has very friable or friable consistence.

Huntington Series

The Huntington series consists of deep, well drained soils that formed in alluvial material washed from lime-influenced soils on uplands. The Huntington soils are mostly on flood plains along the South Branch of the Potomac River. Slopes range from 0 to 3 percent.

Huntington soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Huntington soils are on the landscape with somewhat excessively drained Potomac soils, well drained Chagrin and Tioga soils, moderately well drained Lindside and Lobdell soils, poorly drained Melvin soils, and very poorly drained or poorly drained Dunning soils. The Huntington soils have a darker surface layer than any of those soils except the Dunning soils, have less sand and fewer coarse fragments than the Potomac soils, have less sand than the Chagrin or Lobdell soils, and have less clay than the Dunning soils.

Typical pedon of Huntington loam, in a cultivated field adjacent to a farm lane, about 4.6 miles north of Moorefield, about 0.7 mile east of US Route 220, Hardy County:

Ap—0 to 10 inches, very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; many roots; mildly alkaline; clear smooth boundary.
A1—10 to 16 inches, very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine and medium subangular blocky structure; friable; common roots; neutral; clear wavy boundary.
B21—16 to 29 inches, dark brown (10YR 3/3) silt loam, dark yellowish brown (10YR 4/4) dry; moderate medium subangular blocky structure; friable; common roots; slightly acid; gradual wavy boundary.
B22—29 to 44 inches, dark brown (10YR 3/3) silt loam, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure; friable; common roots; slightly acid; gradual wavy boundary.
B3—44 to 56 inches, dark brown (7.5YR 4/4) loam; weak coarse subangular blocky structure; friable; few roots; slightly acid; abrupt wavy boundary.
C—56 to 62 inches, brown (7.5YR 5/4) gravelly loam; massive; friable; 30 percent gravel and cobbles; slightly acid.

The solum thickness is 40 to 60 inches. The depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 0 to 5 percent in the solum and from 0 to 50 percent in the C horizon. Huntington soils are medium acid to mildly alkaline.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 through 3.

The B horizon has hue of 10YR or 7.5YR, value of 3 through 5, and chroma of 3 or 4. It is silt loam or silty clay loam and is commonly loam in the lower part. It has weak or moderate, fine to coarse, subangular blocky structure. It is friable.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is loam or sandy loam or their gravelly phases. It is stratified in places, and it is friable or very friable.

The Huntington soils in the survey area are a taxadjunct to the Huntington series because they have lower value in the B horizon than defined in the range for the series. This difference does not significantly affect the use and management of the soils.

Laidig Series

The Laidig series consists of deep, well drained soils that formed in acid colluvial material that moved down slope from soils on uplands. The Laidig soils are on foot slopes, in coves, and along small drainageways. Slopes range from 3 to 65 percent.

Laidig soils are mainly in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Laidig soils are on the landscape with well drained Dekalb and Hazleton soils and moderately well drained Buchanan and Ernest Variant soils. The Laidig soils have a fragipan, which is not characteristic of Dekalb, Hazleton, or Ernest Variant soils; have fewer coarse fragments than the Dekalb or Hazleton soils; and are deeper than the Dekalb soils.

Typical pedon of Laidig channery loam in an area of Laidig stony loam, 15 to 35 percent slopes, about 30 yards west of Hunkerson Gap Road, about 2.3 miles east of its junction with WV Route 259, Hardy County:

O2—1 inch to 0, partially decomposed twigs and leaves.

A1—0 to 3 inches, very dark gray (10YR 3/1) channery loam; moderate fine granular structure; very friable; many roots; 45 percent sandstone fragments; extremely acid; abrupt wavy boundary.

A2—3 to 5 inches, dark grayish brown (10YR 4/2) channery sandy loam; weak medium granular structure; friable; many roots; 35 percent sandstone fragments; extremely acid; abrupt wavy boundary.

B1—5 to 14 inches, yellowish brown (10YR 5/6) channery loam; weak fine and medium subangular blocky structure; friable; many roots; 25 percent sandstone fragments; extremely acid; clear wavy boundary.

B21t—14 to 23 inches, yellowish brown (10YR 5/4) channery loam; weak fine and medium subangular blocky structure; friable, slightly sticky; common roots; few discontinuous clay films on faces of peds; 35 percent sandstone fragments; very strongly acid; clear wavy boundary.

B22t—23 to 32 inches, yellowish brown (10YR 5/6) channery loam; weak fine and medium subangular blocky structure; friable, slightly sticky; common roots; many discontinuous clay films on faces of peds; 30 percent sandstone fragments; very strongly acid; clear wavy boundary.

B23t—32 to 36 inches, yellowish brown (10YR 5/6) channery loam; few medium light brownish gray (10YR 6/2) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky; few roots; common discontinuous clay films on faces of peds; 25 percent sandstone fragments; very strongly acid; clear wavy boundary.

Bx1—36 to 46 inches, yellowish brown (10YR 5/6) channery sandy loam; common medium light brownish gray (10YR 6/2) and yellowish red (5YR 5/8) mottles; weak very coarse prismatic structure parting to weak medium platy; firm to very firm and brittle; few roots along faces of prisms; light brownish gray (10YR 6/2) coatings on faces of prisms; 25 percent sandstone fragments; very strongly acid; clear wavy boundary.

Bx2—46 to 61 inches, yellowish brown (10YR 5/4) channery sandy loam; common medium light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; weak very coarse prismatic structure parting to weak medium platy; very firm and brittle; light brownish gray (10YR 6/2) coatings on faces of prisms; 25 percent sandstone fragments; very strongly acid; clear wavy boundary.

C—61 to 72 inches, strong brown (7.5YR 5/6) channery loam; common medium light brownish gray (10YR 6/2) and yellowish red (5YR 5/8) mottles; massive tending to weak medium platy structure; firm; 35 percent sandstone fragments; very strongly acid.

The solum thickness ranges from 60 to 75 inches. The depth to bedrock is more than 60 inches. The content of coarse fragments of sandstone, shale, and siltstone ranges from 15 to 45 percent above the fragipan and from 30 to 60 percent in the fragipan and the C horizon. In unlimed areas the soil is strongly acid to extremely acid.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 1 through 4. It is channery loam, stony loam, or very stony loam.

The B horizon above the fragipan has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 through 6. The fragipan has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 through 6. The B horizon, including the fragipan, is channery or very channery phases of loam, sandy loam, or sandy clay loam. The B horizon above the fragipan has weak or moderate, fine or medium, subangular blocky structure and is friable. The fragipan has weak or moderate, very coarse, prismatic structure

which parts to weak or moderate, fine or medium, subangular blocky or platy. It is firm or very firm.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 through 6. It is channery or very channery phases of loam, sandy loam, or sandy clay loam. It is friable to firm.

Leetonia Series

The Leetonia series consists of deep, well drained to excessively drained soils that formed in acid material weathered from quartzite and conglomerate sandstone. The Leetonia soils are on ridgetops and benches. Slopes range from 3 to 15 percent.

Leetonia soils are on the Appalachian Plateaus in Grant County, mainly on Cabin Mountain. Mean annual precipitation is 47 inches, and mean annual temperatuere is 47 degrees F.

Leetonia soils are on the landscape with well drained Clymer soils, moderately well drained Wharton soils, and somewhat poorly drained or poorly drained Buchanan Variant soils. The Leetonia soils have less clay and more coarse fragments than the Clymer or Wharton soils and do not have the fragipan characteristic of the Buchanan Variant soils.

Typical pedon of Leetonia very gravelly loamy sand, in an area of Leetonia rubbly loamy sand, 3 to 15 percent slopes, about 200 yards south of the Western Maryland property line on the west side of the access road to Old Stony River Dam, about 1 mile from its junction with WV Route 93, at the Grant-Tucker County line:

O2—2 inches to 0, partially decomposed roots, leaves, and stems.

A1—0 to 3 inches, black (10YR 2/1) very gravelly loamy sand; few white sand grains; moderate fine and medium granular structure; very friable; many roots; 50 percent stones and quartzite pebbles; extremely acid; abrupt wavy boundary.

A2—3 to 7 inches, light brownish gray (10YR 6/2) gravelly sand; single grain; loose; many roots; 35 percent coarse fragments; extremely acid; abrupt irregular boundary.

B21h—7 to 11 inches, very dark grayish brown (10YR 3/2) gravelly loamy sand; weak fine subangular blocky structure parting to moderate fine granular; very friable; many roots; 20 percent coarse fragments; extremely acid; abrupt wavy boundary.

B22ir—11 to 13 inches, yellowish red (5YR 4/6) gravelly loamy sand; weak fine and medium subangular blocky structure; very friable; many roots; 20 percent coarse fragments; extremely acid; clear wavy boundary.

B23—13 to 26 inches, strong brown (7.5YR 5/6) gravelly loamy sand; weak medium subangular blocky structure; loose; common roots; 40 percent coarse fragments; very strongly acid; clear wavy boundary.

B3—26 to 45 inches, mixed yellowish brown (10YR 5/4), black (10YR 2/1), and yellowish red (5YR 4/6) gravelly loamy sand; weak medium subangular blocky structure; firm and slightly brittle; few roots; 40 percent coarse fragments; very strongly acid; clear wavy boundary.

C—45 to 60 inches, strong brown (7.5YR 5/6) gravelly loamy sand; single grain; loose; few roots; 45 percent coarse fragments; very strongly acid.

The solum thickness ranges from 20 to 45 inches. The depth to bedrock is more than 40 inches. The content of coarse fragments of sandstone and quartzite pebbles ranges from 20 to 65 percent in individual subhorizons but ranges from 35 to 65 percent in the control section. In unlimed areas the soil is extremely acid or very strongly acid.

The A horizon has hue of 10YR, value of 2 through 6, and chroma of 1 or 2.

The Bh and Bir horizons have hue of 5YR through 10YR, value of 3 or 4, and chroma of 2 through 6. The lower part of the B2 horizon and the B3 horizon have hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 through 6. The B horizon mainly is gravelly or very gravelly phases of sand or loamy sand but has thin horizons of gravelly or very gravelly sandy loam in some pedons. It has weak, fine or medium, subangular blocky, platy or granular structure. The B horizon is loose and very friable or firm.

The C horizon has hue of 7.5YR or 10YR, value of 5 through 7, and chroma of 4 or 6. It is gravelly or very gravelly phases of sand or loamy sand. It is very friable or loose.

Lehew Series

The Lehew series consists of moderately deep, well drained soils that formed in acid material weathered mostly from sandstone. The Lehew soils are on ridgetops, benches, and hillsides. Slopes range from 3 to 65 percent.

Lehew soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Lehew soils are on the landscape with well drained Calvin, Dekalb, and Hazleton soils. The Lehew soils have more sand and less silt than the Calvin soils, do not have the yellowish brown or strong brown typical of the Dekalb and Hazleton soils, and are shallower than the Hazleton soils.

Typical pedon of Lehew channery loam, 25 to 35 percent slopes, in a wooded area on South Branch Mountain, about 20 yards north of Route 12, about 4 miles east of its junction with Route 7, Hardy County:

O2—2 inches to 0, leaf litter and twigs.

A1—0 to 2 inches, black (10YR 2/1) channery loam; weak fine granular structure; very friable; many roots; 15 percent coarse fragments; strongly acid; clear smooth boundary.
A2—2 to 4 inches, brown (7.5YR 5/4) channery loam; weak fine granular structure; friable; many roots; 15 percent coarse fragments; strongly acid; clear wavy boundary.
B1—4 to 9 inches, yellowish red (5YR 4/6) channery loam; moderate very fine subangular blocky structure; friable; many roots; 20 percent coarse fragments; strongly acid; clear wavy boundary.
B2—9 to 18 inches, reddish brown (5YR 4/4) channery loam; moderate fine subangular blocky structure; friable; many roots; 25 percent coarse fragments; strongly acid; gradual wavy boundary.
C—18 to 27 inches, dark reddish brown (2.5YR 3/4) very channery sandy loam; massive; friable; common roots; 75 percent coarse fragments; very strongly acid; abrupt irregular boundary.
R—27 inches, fractured red sandstone.

The solum thickness ranges from 15 to 30 inches, and the depth to bedrock ranges from 20 to 40 inches. Coarse fragments of sandstone and siltstone make up 20 to 60 percent of the solum and 40 to 80 percent of the C horizon. In unlimed areas the soil is strongly acid or very strongly acid.

The A horizon has hue of 10YR or 7.5YR, value of 2 through 6, and chroma of 1 through 4. It is channery, stony, or very stony loam.

The B horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 4 or 6. It is channery or very channery phases of loam, fine sandy loam, or sandy loam. It has weak or moderate, very fine to medium, subangular blocky structure and is friable or very friable.

The C horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 2 or 4. It is channery or very channery phases of sandy loam, fine sandy loam, or loam. It is friable or very friable.

Lickdale Series

The Lickdale series consists of deep, very poorly drained soils that formed in acid material weathered from sandstone and shale. They are on upland flats, in shallow depressions, and along drainageways. Slopes range from 0 to 3 percent.

Lickdale soils are on the Appalachian Plateaus. Mean annual precipitation is 47 inches, and mean annual temperature is 47 degrees F.

Lickdale soils are on the landscape with well drained Clymer soils, moderately well drained Wharton soils, and somewhat poorly drained Cavode soils. The Lickdale soils have less clay than the Wharton or Cavode soils.

Typical pedon of Lickdale loam, in an area of Lickdale stony loam, along the headwaters of Difficult Run, about 1/2 mile east of Route 90/1; about 2.75 miles south of its junction with WV Route 90 in Bayard, Grant County:

O2—4 inches to 0, partially decomposed roots and leaves.
A1—0 to 3 inches, very dark gray (10YR 3/1) loam; weak fine granular structure; very friable; many roots; 5 percent coarse fragments; very strongly acid; clear wavy boundary.
A2g—3 to 6 inches, gray (10YR 5/1) loam; weak fine granular structure; very friable; many roots; 5 percent coarse fragments; very strongly acid; clear wavy boundary.
B1g—6 to 14 inches, gray (10YR 5/1) loam; weak fine subangular blocky structure; very friable; many roots; 10 percent coarse fragments; very strongly acid; clear wavy boundary.
B2g—14 to 30 inches, gray (N 6/0) clay loam; few strong brown (7.5YR 5/6) mottles; very weak coarse subangular blocky structure; friable; few roots; 10 percent coarse fragments; very strongly acid; clear wavy boundary.
Cg—30 to 60 inches, gray (N 6/0) silt loam; few fine strong brown (7.5YR 5/6) mottles; massive; friable; extremely acid.

The solum thickness ranges from 20 to 40 inches. The depth to bedrock is 42 to 72 inches. Coarse fragments mostly of sandstone make up 5 to 20 percent of the solum and 0 to 35 percent of the C horizon. In unlimed areas the soil is strongly acid to extremely acid.

The A horizon has hue of 10YR to 2.5Y, value of 2 through 5, and chroma of 1 or 2.

The B horizon has hue of 10YR to 5Y or is neutral. It has value of 4 through 6 and chroma of 0 through 2. It is dominantly loam or silt loam, but in some pedons it is silty clay loam, clay loam, or sandy clay loam or their channery phases. The B horizon has very weak to moderate, fine to coarse, subangular blocky structure. It is friable or very friable.

The C horizon has hue of 10YR to 5Y or is neutral. It has value of 4 through 6 and chroma of 0 through 2. It is loam, silt loam, or sandy loam or, in a few places, loamy sand or their channery phases. The C horizon is friable, very friable, or loose.

The Lickdale soils in this survey area are a taxadjunct to the Lickdale series because they have a thinner A1 horizon than defined in the range for the series. This difference does not significantly affect the use and management of the soils.

Lindside Series

The Lindside series consists of deep, moderately well drained soils that formed in alluvial material washed from lime-influenced soils on uplands. Slopes range from 0 to 3 percent.

The Lindside soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Lindside soils are on the landscape with well drained Chagrin, Huntington, and Tioga soils; moderately well drained or well drained Massanetta soils; moderately well drained Lobdell soils; poorly drained Melvin soils; and very poorly drained or poorly drained Dunning soils. The Lindside soils do not have the marl substratum characteristic of the Massanetta soils; have less sand than the Tioga, Massanetta, or Lobdell soils; and have less clay than the Dunning soils.

Typical pedon of Lindside silt loam, in an area of Lindside and Lobdell soils, in the Moorefield Industrial Park, about 180 yards west of the railroad tracks, about 15 yards north of the fence on the southern boundary of the property, Hardy County:

Ap—0 to 9 inches, very dark grayish brown (10YR 3/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many roots; neutral; clear wavy boundary.

B1—9 to 14 inches, very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; friable; few roots; slightly acid; gradual wavy boundary.

B21—14 to 18 inches, dark brown (7.5YR 3/2) silt loam; moderate fine subangular blocky structure; friable; few roots; medium acid; clear wavy boundary.

B22—18 to 32 inches, brown (7.5YR 4/4) silty clay loam; few fine pinkish gray (7.5YR 6/2) mottles; common black concretions; weak medium subangular blocky structure; friable; few roots; medium acid; clear wavy boundary.

B3—32 to 42 inches, brown (7.5YR 4/4) and 7.5YR 3/2) silt loam; many fine and medium pinkish gray (7.5YR 6/2) and dark reddish brown (2.5YR 3/4) mottles; common black concretions; weak medium subangular blocky structure; friable; medium acid; clear wavy boundary.

C—42 to 60 inches, brown (7.5YR 4/4) stratified fine sandy loam and clay loam with many fine and medium gray (N 6/0) mottles; massive; friable; medium acid.

The solum thickness ranges from 25 to 50 inches. The depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 0 to 5 percent above a depth of 40 inches and from 0 to 30 percent below 40 inches. Lindside soils are medium acid to mildly alkaline.

The A horizon has hue of 10YR or 7.5YR, value of 2 through 5, and chroma of 1 through 3.

The B horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 2 through 6. It is mainly silt loam or silty clay loam, but in some pedons there are thin horizons of very fine sandy loam, fine sandy loam, loam, or clay loam. The B horizon is weak or moderate, fine or medium, subangular blocky structure and is friable or very friable.

The C horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 1 through 4. It is silty clay loam, silt loam, loam, clay loam, or fine sandy loam or their gravelly phases. In some areas it is weakly stratified. It is friable or very friable.

Lobdell Series

The Lobdell series consists of deep, moderately well drained soils that formed in alluvial material washed from lime-influenced soils on uplands. Slopes range from 0 to 3 percent.

The Lobdell soils are in the Valley and Ridge province in this survey area. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Lobdell soils are on the landscape with somewhat excessively drained Potomac soils; well drained Chagrin, Huntington, and Tioga soils; moderately well drained or well drained Massanetta soils; moderately well drained Lindside soils; poorly drained Melvin soils; and very poorly drained or poorly drained Dunning soils. The Lobdell soils have fewer coarse fragments and less sand than the Potomac soils; have less sand than the Tioga soils; have more sand than the Huntington, Lindside, or Melvin soils; and do not have the marl substratum characteristic of the Massanetta soils.

Typical pedon of Lobdell loam, in an area of Lindside and Lobdell soils, in a pasture about 200 yards east of WV Route 259, about 1/3 mile south of the steel bridge near Lost City, Hardy County:

Ap—0 to 10 inches, dark brown (10YR 3/3) loam, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; friable; many roots; neutral; abrupt smooth boundary.

B21—10 to 17 inches, dark brown (10YR 4/3) loam; weak fine and medium subangular blocky structure; friable; common roots; neutral; clear wavy boundary.

B22—17 to 25 inches, dark brown (10YR 4/3) loam; dark grayish brown (10YR 4/2) ped faces; common medium strong brown (7.5YR 5/6) mottles; a few fine grayish brown (10YR 5/2) mottles at a depth of 22 inches; weak fine subangular blocky structure; friable; common roots; slightly acid; clear wavy boundary.

C1—25 to 44 inches, dark brown (10YR 4/3) loam; common medium grayish brown (10YR 5/2) and dark reddish brown (5YR 3/3) mottles and few fine yellowish red (5YR 5/8) mottles; massive; friable; common roots; slightly acid; abrupt wavy boundary.

C2—44 to 60 inches, dark brown (10YR 4/3) gravelly fine sandy loam; common medium grayish brown (10YR 5/2) and dark reddish brown (5YR 3/3) mottles and few fine yellowish red (5YR 5/8)

mottles; massive; friable; few roots; 45 percent gravel; slightly acid.

The solum thickness ranges from 24 to 40 inches, and the depth to bedrock is more than 60 inches. The content of coarse fragments of gravel ranges from 0 to 5 percent in the A horizon, from 0 to 15 percent in the B and C horizons above a depth of 40 inches, and from 10 to 65 percent below a depth of 40 inches. Lobdell soils are medium acid to neutral.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is loam, silt loam, silty clay loam, or fine sandy loam. The B horizon has weak, fine to coarse, subangular blocky structure. It is friable.

The C horizon has hue of 10YR, value of 4 through 6, and chroma of 1 through 4. It is silt loam, loam, or sandy loam or their gravelly or very gravelly phases. It is friable or very friable.

Massanetta Series

The Massanetta series consists of deep, moderately well drained and well drained soils that formed in alluvial material washed from lime-influenced soils on uplands. The Massanetta soils are on flood plains of streams below limestone springs. Slopes range from 0 to 3 percent.

Massanetta soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Massanetta soils are on the landscape with moderately well drained Lindside and Lobdell soils, poorly drained Melvin soils, and very poorly drained or poorly drained Dunning soils. The Massanetta soils have a marl substratum, which is not characteristic of any of those soils, and have less clay than the Dunning soils and more sand than the Lindside or Melvin soils.

Typical pedon of Massanetta loam, about 3/4 mile west of Kessel, about 375 yards southeast of Route 10/8, about 1/2 mile west of its junction with Route 10/6, Hardy County:

Ap—0 to 8 inches, dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; moderate fine and medium granular structure; friable; common roots; 5 percent marl fragments; moderately alkaline; abrupt smooth boundary.

B1—8 to 17 inches, very dark gray (10YR 3/1) silt loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; friable; common roots; 5 percent marl fragments; moderately alkaline; clear wavy boundary.

B2—17 to 29 inches, dark grayish brown (10YR 4/2) loam; weak medium subangular blocky structure; friable; few roots; 5 percent marl fragments; moderately alkaline; gradual wavy boundary.

B3—29 to 47 inches, grayish brown (10YR 5/2) loam; common fine and medium yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few roots; 5 percent marl fragments; moderately alkaline; clear wavy boundary.

C—47 to 60 inches, light brownish gray (10YR 6/2) gravelly sandy loam; many medium yellow (10YR 7/8) and red (2.5YR 4/6) mottles; massive; friable; 30 percent marl fragments; moderately alkaline.

The solum thickness ranges from 20 to 50 inches. The depth to bedrock is more than 60 inches. Coarse fragments mostly of marl concretions make up 0 to 10 percent of the solum and 0 to 30 percent of the C horizon. In most pedons layers of marl are below a depth of 30 inches. The soil is mildly alkaline or moderately alkaline.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 through 3.

The B horizon has hue of 10YR, value of 3 through 6, and chroma of 1 through 4. It is silt loam, loam, silty clay loam, or clay loam. The B horizon has weak or moderate, fine to coarse, subangular blocky. It is friable.

The C horizon has hue of 7.5YR or 10YR, value of 2 through 6, and chroma of 0 through 2. It is loam, silt loam, clay loam, silty clay loam, or sandy loam or their gravelly phases. The C horizon is friable or very friable.

The Massanetta soils in this survey area are a taxadjunct to the Massanetta series because they have a slightly thinner surface layer, have a thicker solum, and are coarser textured in the B2 horizon than defined in the range for the series. These differences do not significantly affect the use and management of the soils.

Melvin Series

The Melvin series consists of deep, poorly drained soils that formed in alluvial material washed from lime-influenced soils on uplands. The Melvin soils are on flood plains. Slopes range from 0 to 3 percent.

Melvin soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Melvin soils are on the landscape with well drained Chagrin, Huntington, and Tioga soils; moderately well drained or well drained Massanetta soils; moderately well drained Basher, Lindside, and Lobdell soils; and very poorly drained or poorly drained Dunning soils. Melvin soils have less sand than the Chagrin, Tioga, Massanetta, Basher, or Lobdell soils; have less clay than the Dunning soils; and do not have the marl substratum characteristic of the Massanetta soils.

Typical pedon of Melvin silt loam, in a hay field about 6.1 miles south of Moorefield, about 360 feet west of Route 7, Hardy County:

Ap—0 to 9 inches, dark gray (10YR 4/1) silt loam; common fine yellowish red (5YR 5/8) mottles; moderate fine granular structure; friable; many roots; medium acid; clear smooth boundary.
B21g—9 to 22 inches, gray (10YR 5/1) silt loam; few medium strong brown (7.5YR 5/6) mottles; moderate very fine subangular blocky structure; friable; common roots; slightly acid; gradual wavy boundary.
B22g—22 to 32 inches, light gray (N 7/0) silt loam; many medium strong brown (7.5YR 5/8) and brownish yellow (10YR 6/8) mottles; moderate fine subangular blocky structure; friable; few roots; few black (10YR 2/1) concretions; slightly acid; gradual wavy boundary.
Cg—32 to 60 inches, light gray (N 7/0) silt loam; many medium strong brown (7.5YR 5/8) and light reddish brown (5YR 6/4) mottles; massive; friable and very friable; few roots; common black (10YR 2/1) concretions; slightly acid.

The solum thickness ranges from 20 to 40 inches. The depth to bedrock is more than 60 inches. The content of coarse fragments of gravel ranges from 0 to 5 percent above a depth of 30 inches and from 0 to 20 percent below that depth. Melvin soils are medium acid to mildly alkaline in the upper part of the solum and slightly acid to mildly alkaline in the lower part of the solum and in the C horizon.

The A horizon has hue of 10YR through 2.5Y, value of 4 through 6, and chroma of 1 through 3.

The B horizon has hue of 10YR through 5Y or is neutral. It has value of 4 through 7 and chroma of 0 through 2. It is silt loam or silty clay loam. It has weak or moderate, fine or medium, granular or subangular blocky structure and is friable or very friable.

The C horizon has hue of 10YR through 5Y or is neutral. It has value of 4 through 7 and chroma of 0 through 2. It mainly is silt loam or silty clay loam. Below a depth of 40 inches, some pedons have stratified layers of loam, clay, or sand and gravel. The C horizon is friable or very friable.

Mertz Series

The Mertz series consists of deep, well drained soils that formed in acid colluvial material which moved down slope from soils on uplands. The Mertz soils are on narrow ridgetops, along foot slopes, and on sideslopes. Slopes range from 8 to 25 percent.

Mertz soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Mertz soils are on the landscape with well drained Berks, Elliber, Murrill, and Weikert soils. The Mertz soils are deeper than the Berks or Weikert soils, have more clay than the Elliber soils, have more coarse fragments and have less clay in the lower part of the solum than the Murrill soils.

Typical pedon of Mertz cherty loam, 8 to 15 percent slopes, along the east side of Route 2/1, about 1.3 miles north of its junction with Route 220/2, Hardy County:

A1—0 to 2 inches, very dark gray (10YR 3/1) cherty loam; weak fine granular structure; very friable; many roots; 35 percent coarse fragments; strongly acid; abrupt wavy boundary.
A21—2 to 4 inches, dark grayish brown (10YR 4/2) very cherty sandy loam; weak fine granular structure; very friable; many roots; 50 percent coarse fragments; strongly acid; clear wavy boundary.
A22—4 to 8 inches, yellowish brown (10YR 5/4) cherty loam; weak fine granular structure; friable; many roots; 40 percent coarse fragments; strongly acid; clear wavy boundary.
B1—8 to 18 inches, yellowish brown (10YR 5/6) very cherty loam; pockets of very cherty sandy loam; weak fine subangular blocky structure parting to weak fine granular; friable; many roots; 50 percent coarse fragments; strongly acid; clear wavy boundary.
B21t—18 to 30 inches, yellowish red (5YR 5/6) cherty silty clay loam; pockets of cherty silty clay; moderate fine and medium subangular blocky structure; friable; common roots; many discontinuous clay films on faces of peds; 35 percent coarse fragments; very strongly acid; gradual wavy boundary.
B22t—30 to 39 inches, red (2.5YR 4/6) cherty silty clay loam; moderate fine and medium subangular blocky structure; friable; common roots; continuous clay films on faces of peds; 40 percent coarse fragments; very strongly acid; gradual wavy boundary.
B23t—39 to 55 inches, yellowish red (5YR 5/6) very cherty silty clay loam; moderate fine and medium subangular blocky structure; friable; few roots; few discontinuous clay films on faces of peds; 65 percent coarse fragments; very strongly acid; gradual wavy boundary.
C—55 to 60 inches, strong brown (7.5YR 5/6) very cherty sandy clay loam; massive; firm; 80 percent coarse fragments; very strongly acid.

The solum thickness ranges from 40 to 70 inches. The depth to bedrock is more than 60 inches. Coarse fragments primarily of chert and some sandstone and shale make up 30 to 50 percent of the upper part of the solum and 30 to 80 percent of the lower part of the solum and of the C horizon. In unlimed areas the soil is strongly acid or medium acid in the upper part of the solum and strongly acid or very strongly acid in the lower part of the solum and in the C horizon.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 1 through 4.

The B horizon has hue of 2.5YR through 10YR and value and chroma of 4 through 6. The B horizon is cherty or very cherty phases of loam, silt loam, silty clay loam, or clay loam. The B horizon has weak or moderate, fine to coarse, subangular blocky or blocky structure. It is friable to firm.

The C horizon has hue of 10YR to 2.5YR and value and chroma of 4 through 6. It is cherty or very cherty phases of loam, clay loam, sandy clay loam, silt loam, or silty clay loam. It is friable or firm.

Monongahela Series

The Monongahela series consists of deep, moderately well drained soils that formed in alluvial material washed from acid soils on uplands. Monongahela soils are on terraces mainly along the rivers of the survey area. Slopes range from 0 to 15 percent.

Monongahela soils are in the Valley and Ridge province. Mean annual temperature is 51 degrees F, and mean annual precipitation is 34 inches.

Monongahela soils are on the landscape with well drained Allegheny soils, moderately well drained Ernest and Tygart Variant soils, somewhat poorly drained Tygart soils, and poorly drained or very poorly drained Purdy soils. The Monongahela soils have a fragipan, which is not characteristic of the Allegheny, Tygart Variant, Tygart, or Purdy soils, and have low chroma mottles beginning lower in the B2t horizon than the Ernest soils. The Monongahela soils have less clay than the Tygart Variant, Tygart, or Purdy soils.

Typical pedon of Monongahela silt loam, 3 to 8 percent slopes, in a cultivated field about 0.6 mile northeast of Fisher, along Route 10/3, about 100 feet west of powerline, about 10 yards north of woodland, about 35 yards east of the corner of the woods, and about 185 yards east of an old house, Hardy County:

Ap—0 to 7 inches, brown (10YR 5/3) silt loam; weak fine granular structure; friable; many roots; 10 percent coarse fragments; medium acid; clear wavy boundary.

A2—7 to 10 inches, yellowish brown (10YR 5/4) silt loam; weak fine platy structure; friable; many roots; 10 percent coarse fragments; medium acid; abrupt wavy boundary.

B2t—10 to 20 inches, yellowish brown (10YR 5/6) silt loam; weak fine subangular blocky structure; friable; common roots; common discontinuous clay films on faces of peds; strongly acid; gradual wavy boundary.

Bx1—20 to 26 inches, yellowish brown (10YR 5/6) silt loam; few fine and medium light brownish gray (10YR 6/2) mottles; weak very coarse prismatic structure parting to moderate medium platy; very firm and brittle; few roots; many discontinuous clay films on faces of peds; strongly acid; gradual wavy boundary.

Bx2—26 to 36 inches, yellowish brown (10YR 5/6) silt loam; common medium light brownish gray (10YR 6/2) and yellowish red (5YR 5/6) mottles; weak very coarse prismatic structure parting to moderate medium platy; very firm and brittle; few roots; many discontinuous clay films on faces of peds; strongly acid; clear wavy boundary.

Bx3—36 to 42 inches, yellowish brown (10YR 5/4) silt loam; many medium light brownish gray (10YR 6/2) and yellowish red (5YR 5/8) mottles; weak very coarse prismatic structure parting to weak medium platy; firm and brittle; common discontinuous clay films on faces of peds; 5 percent coarse fragments; strongly acid; clear wavy boundary.

C—42 to 60 inches, yellowish brown (10YR 5/4) gravelly silt loam; many light brownish gray (10YR 6/2) and yellowish red (5YR 5/8) mottles; weak coarse platy structure; firm; 20 percent coarse fragments; very strongly acid.

The solum thickness ranges from 40 to 72 inches, and the depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 0 to 15 percent above the fragipan, from 0 to 25 percent in the fragipan, and from 10 to 40 percent in the C horizon. In unlimed areas the soil is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4.

The B horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 4 through 8. It is loam, silt loam, silty clay loam, clay loam, or sandy clay loam. The Bx horizon has hue of 7.5YR through 2.5Y, value of 5 or 6, and chroma of 2 through 6. It is silt loam, loam, sandy clay loam, or clay loam or their gravelly phases. The B horizon has weak or moderate, fine or medium, subangular blocky structure. It is friable above the fragipan. The Bx horizon has weak or moderate, very coarse, prismatic structure. It is firm or very firm.

The C horizon has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 2 through 8. It is sandy loam, sandy clay loam, loam, clay loam, silty clay loam, or silt loam or their gravelly or cobbly phases. It is friable or firm.

Monongahela Variant

The Monongahela Variant consists of deep, moderately well drained soils that formed in alluvial material washed from acid soils on uplands. These soils are on terraces mainly along the Cacapon River in Hardy County. Slopes range from 3 to 8 percent.

Monongahela Variant soils are in the Valley and Ridge province. Mean annual temperature is 51 degrees F, and mean annual precipitation is 34 inches.

Monongahela Variant soils are on the landscape with the well drained Allegheny and Allegheny Variant soils. The Monongahela Variant soils have a fragipan, which is

not characteristic of the Allegheny or Allegheny Variant soils.

Typical pedon of Monongahela Variant fine sandy loam, 3 to 8 percent slopes, in a field on the West Virginia University Reymann Memorial Farm, about 190 yards east of WV Route 259, about 36 yards north of the fence at the south boundary of farm, Hardy County:

Ap—0 to 9 inches, dark brown (10YR 3/3) fine sandy loam; weak fine granular structure; friable; many roots; 2 percent gravel; medium acid; abrupt smooth boundary.

B21t—9 to 19 inches, yellowish brown (10YR 5/4) fine sandy loam; weak medium subangular blocky structure; friable; few roots; 2 percent coarse fragments; clay bridging of sand grains and clay films in pores; medium acid; clear wavy boundary.

B22t—19 to 30 inches, strong brown (7.5YR 5/6) fine sandy loam; common fine and medium mottles of light brownish gray (10YR 6/2); weak medium prismatic structure parting to weak medium subangular blocky; friable; few roots; clay bridging of sand grains and clay films in pores; 2 percent coarse fragments; strongly acid; clear wavy boundary.

Bx—30 to 43 inches, yellowish brown (10YR 5/6) fine sandy loam; common fine and medium light brownish gray (10YR 6/2) mottles and a few fine reddish brown (5YR 4/4) mottles; weak very coarse prismatic structure; very firm and brittle; clay bridging of sand grains and clay films in pores; 2 percent coarse fragments; strongly acid; gradual wavy boundary.

C—43 to 60 inches, yellowish brown (10YR 5/4) gravelly fine sandy loam; common medium light brownish gray (10YR 6/2) mottles; massive; firm; 40 percent coarse fragments; common fine red (2.5YR 4/8) highly weathered shale fragments; strongly acid.

The solum thickness ranges from 40 to 55 inches, and the depth to bedrock is more than 60 inches. Coarse fragments of gravel and cobbles make up 0 to 15 percent of the solum above the fragipan, 0 to 25 percent of the fragipan, and 10 to 60 percent of the C horizon. In unlimed areas the soil is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 2 or 3.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 4 through 8. It is fine sandy loam, loam, sandy loam, clay loam, or sandy clay loam or their gravelly phases. The B horizon above the fragipan has weak to moderate, fine to medium, subangular blocky or prismatic structure and is friable. The Bx horizon has hue of 7.5YR through 2.5Y, value of 5 or 6, and chroma of 2 through 6. It is fine sandy loam, loam, sandy loam, or sandy clay loam or their gravelly phases. The Bx horizon has weak to moderate, very coarse, prismatic structure and is firm or very firm.

The C horizon has hue of 10YR to 2.5Y, value of 5 through 7, and chroma of 2 through 6. It is fine sandy loam, sandy loam, or loamy sand or their gravelly phases. It is very friable to firm.

Murrill Series

The Murrill series consists of deep, well drained soils formed in acid colluvial material over limy shales or limestone. The colluvial material moved down slope mainly from soils on uplands. The Murrill soils are on foot slopes, in coves, on benches, along drainageways, and on hillsides. Slopes range from 8 to 65 percent.

Murrill soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Murrill soils are on the landscape with well drained Dekalb, Elliber, Hazleton, Mertz and Opequon soils. The Murrill soils are deeper than the Dekalb soils, have fewer coarse fragments and more clay than the Dekalb or Hazleton soils, have fewer coarse fragments and contain more clay in the lower part of the solum than the Elliber or Mertz soils, and are deeper and have less clay in the upper part of the solum than the Opequon soils.

Typical pedon of Murrill channery loam, in an area of Murrill stony loam, 15 to 35 percent slopes, in a wooded area about 1.2 miles east of the junction of Hunkerson Gap Road and WV Route 259, and about 200 yards north of the crossing of Hunkerson Gap Road over Capon Run, Hardy County:

A1—0 to 2 inches, very dark gray (10YR 3/1) channery loam; moderate fine granular structure; very friable; many roots; 25 percent coarse fragments; strongly acid; abrupt wavy boundary.

A2—2 to 9 inches, brown (10YR 5/3) channery loam; weak medium granular structure; friable; many roots; 20 percent coarse fragments; strongly acid; clear wavy boundary.

B1—9 to 20 inches, yellowish brown (10YR 5/6) channery loam; weak medium subangular blocky structure; friable; common roots; few discontinuous clay films on faces of peds; 20 percent coarse fragments; strongly acid; clear wavy boundary.

B21t—20 to 30 inches, strong brown (7.5YR 5/6) channery silt loam; weak fine subangular blocky structure; friable; common roots; few discontinuous clay films on faces of peds; 20 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—30 to 46 inches, strong brown (7.5YR 5/6) channery clay loam; weak medium subangular blocky structure; friable; few roots; few discontinuous clay films on faces of peds; common black (10YR 2/1) coatings; 15 percent coarse fragments; strongly acid; gradual wavy boundary.

B23t—46 to 54 inches, yellowish red (5YR 5/6) channery silty clay loam weak medium subangular blocky structure; friable; few roots; few discontinuous clay films on faces of peds; common black (10YR 2/1) coatings; 20 percent coarse fragments; strongly acid; abrupt wavy boundary.
IIB24t—54 to 75 inches, yellowish red (5YR 5/8) channery silty clay; moderate fine blocky structure; friable; few roots; continuous clay films on faces of peds; 15 percent coarse fragments; strongly acid; gradual wavy boundary.

The solum thickness is 60 inches or more. The depth to bedrock is more than 72 inches. Coarse fragments of sandstone or chert make up 5 to 30 percent of the upper part of the solum, and shale or limestone fragments make up 0 to 40 percent of the IIB horizon. In unlimed areas the soil is very strongly acid to medium acid.

The A horizon has hue of 10YR, value of 2 through 5, and chroma of 1 through 4. It is stony loam or cherty silt loam.

The B horizon has hue of 10YR or 5YR and value and chroma of 4 through 6. It is silt loam, loam, sandy clay loam, clay loam, or silty clay loam or their channery phases. It has weak or moderate, fine or medium, subangular blocky structure and is friable. The IIB horizon has hue of 2.5YR to 10YR, value of 3 through 6, and chroma of 1 through 8. It is silty clay loam, silty clay, clay loam, or clay. It has weak to strong, fine or medium, subangular blocky and blocky structure and is friable or firm.

Murrill Variant

The Murrill Variant consists of deep, well drained, acid soils that formed in a thin colluvial mantle over residuum mostly from acid and calcareous sandstone and shale. These soils are on ridgetops and benches. Slopes range from 8 to 25 percent.

Murrill Variant soils are in the Valley and Ridge province. Mean annual temperature is 51 degrees F, and mean annual precipitation is 34 inches.

Murrill Variant soils are on the landscape with well drained Dekalb and Hazleton soils but are deeper than the Dekalb soils and have fewer coarse fragments and more clay than the Dekalb or Hazleton soils.

Typical pedon of Murrill Variant channery fine sandy loam, 8 to 15 percent slopes, along the east side of Route 10/7, approximately 1/2 mile south of its intersection with Route 10, near Kessel, Hardy County:

O1—2 inches to 0, leaf litter and twigs.
A1—0 to 4 inches, dark grayish brown (10YR 4/2) channery fine sandy loam; moderate fine and medium granular structure; friable; many roots; 20 percent coarse fragments; very strongly acid; abrupt smooth boundary.
A2—4 to 9 inches, light yellowish brown (10YR 6/4) channery fine sandy loam; weak medium granular structure; friable; many roots; 20 percent coarse fragments; strongly acid; clear wavy boundary.
B11—9 to 12 inches, light yellowish brown (10YR 6/4) fine sandy loam; few fine yellowish red (5YR 5/8) mottles; weak fine subangular blocky structure; friable; many roots; 10 percent coarse fragments; strongly acid; clear wavy boundary.
B12t—12 to 15 inches, yellowish brown (10YR 5/4) fine sandy loam; pockets of clay loam; many fine yellowish red (5YR 4/8) mottles; weak medium subangular blocky structure; friable; few discontinuous clay films on faces of peds; many roots; 2 percent coarse fragments; strongly acid; clear wavy boundary.
IIB21t—15 to 22 inches, red (10R 4/8) silty clay; moderate fine blocky structure; firm; many discontinuous clay films on faces of peds; many roots; strongly acid; clear wavy boundary.
IIB22t—22 to 30 inches, red (10R 4/8) clay loam; common fine and medium yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; many discontinuous clay films on faces of peds; common roots; 10 percent coarse fragments; strongly acid; clear wavy boundary.
IIB23t—30 to 39 inches, red (10R 4/8) silty clay loam; moderate medium blocky structure; firm; many discontinuous clay films on faces of peds; common roots; 5 percent coarse fragments; strongly acid; clear wavy boundary.
IIB3t—39 to 56 inches, red (10R 4/8) clay loam; common fine and medium light olive brown (2.5Y 5/6) mottles; weak very coarse platy structure; firm; few discontinuous clay films on faces of peds; few roots; strongly acid; gradual wavy boundary.
C—56 to 60 inches, red (2.5YR 4/6) clay loam; common fine and medium light olive brown (2.5Y 5/6) mottles; massive; firm; few roots; strongly acid.

The solum thickness ranges from 35 to 60 inches, and the depth to bedrock is more than 60 inches. The depth to the IIB horizon ranges from 13 to 30 inches. The content of coarse fragments ranges from 15 to 30 percent in the A horizon and from 0 to 25 percent in the B and C horizons. In unlimed areas the soil is medium acid to extremely acid.

The A horizon has hue of 10YR, value of 3 through 7, and chroma of 1 through 6.

The upper part of the B horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 or 6. It is loam or fine sandy loam or their channery phases. The IIB horizon has hue of 5YR through 10R, value of 4 through 6, and chroma of 4 through 8. It is silty clay loam, clay loam, or silty clay or their channery phases. The B horizon, including the IIB horizon, has weak to strong,

fine to very coarse, subangular blocky, blocky, or platy structure. It is friable or firm.

The C horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 6 or 8. It is silty clay loam, clay loam, or silty clay or their channery phases. It is friable to firm.

Opequon Series

The Opequon series consists of shallow, well drained soils that formed in material weathered from limestone or limy shales. The Opequon soils are on ridgetops, benches, and hillsides. Slopes range from 3 to 65 percent.

Opequon soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Opequon soils are on the landscape with well drained Dekalb, Edom, Elliber, Hazleton, and Murrill soils. The Opequon soils are shallower than any of those soils; have fewer coarse fragments and more clay than the Dekalb, Elliber, or Hazleton soils; and have more clay in the upper part of the solum than the Murrill soils.

Typical pedon of Opequon silt loam, in an area of Opequon silt loam, very rocky, 35 to 65 percent slopes, in a wooded area about 120 yards north of Route 7/1, about 2.8 miles west of its junction with Route 7, Hardy County:

A1—0 to 2 inches, dark brown (7.5YR 3/2) silt loam; moderate fine granular structure; friable; many roots; 10 percent coarse fragments; neutral; clear wavy boundary.

A2—2 to 5 inches, reddish brown (5YR 4/4) silt loam; moderate medium granular structure; friable; many roots; 5 percent coarse fragments; neutral; abrupt wavy boundary.

B21t—5 to 9 inches, red (2.5YR 4/6) silty clay; moderate medium blocky structure; friable, sticky and plastic; common roots; continuous clay films on faces of peds; neutral; clear wavy boundary.

B22t—9 to 14 inches, red (2.5YR 4/6) silty clay; strong fine blocky structure; friable and firm, sticky and plastic; continuous clay films on faces of peds; neutral; clear wavy boundary.

B23t—14 to 16 inches, red (2.5YR 4/6) silty clay; moderate fine and medium subangular blocky structure; friable, sticky and plastic; common roots; continuous clay films on faces of peds; mildly alkaline; abrupt irregular boundary.

R—16 inches, hard gray limestone.

The solum thickness and depth to bedrock range from 12 to 20 inches. The content of coarse fragments, mostly of limestone and some sandstone, chert, and limy shale, ranges from 0 to 35 percent. The soil is medium acid to mildly alkaline.

The A horizon has hue of 10YR through 5YR, value of 3 through 5, and chroma of 1 through 4.

The B horizon has hue of 2.5YR through 7.5YR, value of 4 or 5, and chroma of 4 through 8. It is silty clay loam, silty clay, or clay or their channery phases. It has fine or medium, moderate or strong, blocky or subangular blocky structure and is friable or firm.

Potomac Series

The Potomac series consists of deep, somewhat excessively drained soils that formed in gravelly alluvial material washed from lime-influenced soils on uplands. The Potomac soils are on flood plains. Slopes range from 0 to 3 percent.

Potomac soils are mainly in the Valley and Ridge province. A few areas are on the Appalachian Plateaus. In the Valley and Ridge province, mean annual precipitation is 34 inches and mean annual temperature is 51 degrees F. On the Appalachian Plateaus, mean annual temperature is 47 degrees F and mean annual precipitation is 47 inches.

Potomac soils are on the landscape with well drained Chagrin, Huntington, and Tioga soils and moderately well drained Basher, Lindside, and Lobdell soils. Potomac soils have more coarse fragments and more sand than any of those soils.

Typical pedon of Potomac fine sandy loam, about 13.5 miles south of Moorefield, about 1 mile north of Brake, about 150 yards east of Route 7, and about 75 yards west of the river, Hardy County:

Ap—0 to 7 inches, dark yellowish brown (10YR 3/4) fine sandy loam; weak fine and medium granular structure; very friable; many roots; 5 percent gravel; slightly acid; abrupt wavy boundary.

A1—7 to 10 inches, dark brown (10YR 3/3) fine sandy loam; weak fine and medium granular structure; very friable; many roots; 10 percent gravel and cobblestones; neutral; abrupt wavy boundary.

IIC1—10 to 27 inches, dark yellowish brown (10YR 4/4) very cobbly loamy sand; single grain; loose; common roots; few pockets of very cobbly sand; 70 percent cobblestones and gravel; neutral; gradual wavy boundary.

IIC2—27 to 60 inches, dark yellowish brown (10YR 4/4) very gravelly loamy sand; single grain; loose; few roots; common pockets of very gravelly sand; 60 percent gravel and cobblestones; neutral.

The solum thickness ranges from 5 to 12 inches. The depth to bedrock is more than 60 inches. Coarse fragments of gravel and cobbles make up 0 to 50 percent of the solum and 35 to 70 percent of the C horizon. A few pedons have subhorizons which either lack or have a low percentage of coarse fragments. The soil is strongly acid to neutral.

The A horizon has hue of 7.5YR or 10YR and value and chroma of 2 through 4. It is fine sandy loam or cobbly loam.

The C horizon has hue of 10YR or 7.5YR, value of 3 through 5, and chroma of 3 or 4. It mainly is very gravelly, gravelly, very cobbly, or cobbly phases of sand or loamy sand. Thin subhorizons of sandy loam or gravelly or cobbly phases of sandy loam are in some pedons.

Purdy Series

The Purdy series consists of deep, poorly drained or very poorly drained soils that formed in alluvial material washed from acid and lime-influenced soils on uplands. They are on terraces along rivers. Slopes range from 0 to 3 percent.

Purdy soils are in the Valley and Ridge province. Mean annual temperature is 51 degrees F, and mean annual precipitation is 34 inches.

Purdy soils are on the landscape with well drained Allegheny and Allegheny Variant soils, moderately well drained Monongahela soils, and somewhat poorly drained Tygart soils. The Purdy soils have more clay than the Allegheny, Allegheny Variant, or Monongahela soils, and they do not have the fragipan characteristic of the Monongahela soils.

Typical pedon of Purdy silt loam, in Moorefield Industrial Park, about 20 yards south of the northern property boundary, about 150 yards west of US Route 220, Hardy County:

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

B1g—9 to 13 inches, grayish brown (10YR 5/2) silty clay loam; few fine red (10R 4/8) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; many roots; strongly acid; clear wavy boundary.

B21tg—13 to 17 inches, grayish brown (10YR 5/2) silty clay; common fine red (10R 4/8) mottles and few fine light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; many discontinuous clay films on faces of peds; common roots; very strongly acid; clear wavy boundary.

B22tg—17 to 31 inches, gray (N 5/0) silty clay; many fine and medium red (10R 4/8) mottles; weak medium subangular blocky structure; firm; continuous clay films on faces of peds; few roots; very strongly acid; gradual wavy boundary.

C1g—31 to 44 inches, gray (N 5/0) clay; few fine and medium red (2.5YR 4/6) mottles; massive; firm; few roots; very strongly acid; clear wavy boundary.

C2g—44 to 60 inches, gray (N 5/0) silty clay; few fine and medium strong brown (7.5YR 5/6) mottles; massive; firm; few roots; slightly acid.

The solum thickness ranges from 28 to 50 inches. The depth to bedrock is more than 60 inches. These soils are generally free of coarse fragments. In unlimed areas the soil is strongly acid or very strongly acid in the upper part of the solum and very strongly acid to slightly acid in the lower part of the solum and in the C horizon.

The A horizon is neutral or has hue of 10YR or 2.5Y value of 3 through 5, and chroma of 0 through 2.

The B horizon has hue of 10YR to 2.5Y or is neutral. It has value of 4 or 5 and chroma of 0 through 2. It is silty clay, clay, silty clay loam, or clay loam. It has weak or moderate, fine or medium, prismatic or subangular blocky structure. It is friable or firm.

The C horizon has hue of 10YR through 2.5Y or is neutral. It has value of 4 through 6 and chroma of 0 through 3. It is silty clay, clay, or clay loam. It is friable or firm.

The Purdy soils in this survey area are a taxadjunct to the Purdy series because they have slightly higher base saturation than defined in the range for the series. This difference does not significantly affect the use and management of the soils.

Rushtown Series

The Rushtown series consists of soils that formed in acid material weathered from shale. Rushtown soils are on hillsides. Slopes range from 35 to 65 percent.

Rushtown soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Rushtown soils are on the landscape with well drained Berks and Weikert soils but are deeper than those soils.

Typical pedon of Rushtown shaly silt loam, 35 to 65 percent slopes, about 1.3 miles west of Fisher, about 50 yards south of Route 10, about 30 feet from the north end of the quarry, Hardy County:

A1—0 to 4 inches, very dark brown (10YR 2/2) shaly silt loam; moderate fine granular structure; very friable; many roots; 30 percent coarse fragments; medium acid; abrupt wavy boundary.

A2—4 to 8 inches, yellowish brown (10YR 5/4) shaly silt loam; weak fine granular structure; friable; 45 percent coarse fragments; medium acid; clear wavy boundary.

B1—8 to 17 inches, yellowish brown (10YR 5/4) very shaly silt loam; weak fine subangular blocky structure; friable; common roots; 55 percent coarse fragments; strongly acid; clear wavy boundary.

B2—17 to 22 inches, strong brown (7.5YR 5/6) shaly silt loam; weak fine subangular blocky structure; friable;

common roots; 35 percent coarse fragments; strongly acid; clear wavy boundary.
C1—22 to 29 inches, yellowish brown (10YR 5/4) very shaly silt loam; very friable; common roots; 80 percent coarse fragments; strongly acid; 1 inch discontinuous horizon of yellowish brown (10YR 5/4) and yellowish red (5YR 4/6) shaly silt loam at 28 inches; gradual wavy boundary.
C2—29 to 60 inches, brown (10YR 5/3) very shaly silt loam; single grain; loose; few roots; 85 percent coarse fragments; strongly acid.

The solum thickness ranges from 15 to 35 inches, and the depth to bedrock ranges from 5 feet to more than 30 feet. Coarse fragments of shale make up 15 to 50 percent of the A horizon, 20 to 60 percent of the B horizon, and 60 to 90 percent of the C horizon. In unlimed areas the soil is medium acid to very strongly acid.

The A horizon has hue of 10YR, value of 2 through 5, and chroma of 2 through 4.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. It is shaly silt loam or very shaly silt loam. It has weak or very weak, fine or medium, subangular blocky structure. It is firm to very friable.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 through 6. It is very shaly silt loam and is friable, very friable, or loose.

Schaffenaker Series

The Schaffenaker series consists of moderately deep, well drained soils that formed in acid material weathered from sandstone. The Schaffenaker soils are on ridgetops, benches, and hillsides. They are mainly in the Wardensville area, in the mountains east of Lost River in Hardy County, and on New Creek Mountain in Grant County. Slopes range from 3 to 65 percent.

Schaffenaker soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Schaffenaker soils are on the landscape with excessively drained Drall soils and well drained Allegheny Variant, Dekalb, and Hazleton soils. The Schaffenaker soils are shallower than the Drall, Allegheny Variant, or Hazleton soils; have fewer coarse fragments than the Drall or Allegheny Variant soils; contain less clay than the Allegheny Variant soils; and have fewer coarse fragments and more sand than the Dekalb soils.

Typical pedon of Schaffenaker loamy sand, in an area of Schaffenaker-Drall stony loamy sands, 15 to 35 percent slopes, in a wooded area on Sandy Ridge near Wardensville, about 440 yards southeast of U.S. Forest Service Route 344, about 1 mile from its junction with WV Route 259, about 30 yards downslope from the logging road, Hardy County:

O1—1 inch to 0, leaves, roots, and twigs.
A1—0 to 3 inches, very dark gray (10YR 3/1) loamy sand; weak fine granular structure; very friable; many roots; 5 percent coarse fragments; common white sand grains; very strongly acid; abrupt wavy boundary.
A2—3 to 6 inches, pale brown (10YR 6/3) loamy sand; weak fine granular structure; very friable; many roots; 5 percent coarse fragments; very strongly acid; clear wavy boundary.
B1—6 to 18 inches, brownish yellow (10YR 6/6) loamy sand; few pockets of very pale brown (10YR 7/3); very weak fine subangular blocky structure; very friable; many roots; 5 percent coarse fragments; very strongly acid; clear wavy boundary.
B2—18 to 25 inches, light yellowish brown (10YR 6/4) loamy sand; few small pockets of very pale brown (10YR 7/3); very weak medium and coarse subangular blocky structure; very friable; many roots; 10 percent coarse fragments; very strongly acid; clear wavy boundary.
C—25 to 38 inches, yellowish brown (10YR 5/4) channery sand; single grain; loose; few roots; 40 percent coarse fragments; very strongly acid; clear wavy boundary.
R—38 inches, hard sandstone.

The solum thickness ranges from 15 to 30 inches, and the depth to bedrock is 20 to 40 inches. Coarse fragments of sandstone make up 0 to 30 percent of the solum and 0 to 50 percent of the C horizon. In unlimed areas the soil is strongly acid to extremely acid.

The A horizon has hue of 10YR, value of 2 through 6, and chroma of 1 through 4.

The B horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 3 through 8. It is loamy sand or sand or their channery phases. It has very weak, fine to coarse, subangular blocky structure; or weak, fine or medium, granular structure; or is single grain. It is loose to very friable.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 through 8. It is sand or loamy sand or their channery phases. It is very friable or loose.

Shouns Series

The Shouns series consists of deep, well drained soils that formed in acid material that moved downslope from soils on uplands. The Shouns soils are along foot slopes, on benches, and on hillsides. Slopes range from 15 to 35 percent.

Shouns soils are along the eastern edge of Allegheny Mountain in Grant County. Mean annual precipitation is about 47 inches, and mean annual temperature is about 47 degrees F.

Shouns soils are on the landscape with well drained Belmont and Calvin high base substratum soils. The

Shouns soils have less clay and a thicker solum than the Belmont soils and are deeper and have fewer coarse fragments than the Calvin high base substratum soils.

Typical pedon of Shouns silt loam, in an area of Shouns very stony silt loam, 15 to 35 percent slopes, along a farm lane 25 yards northwest of the farmhouse, 200 yards southwest of Route 4/2, 2.75 miles west of its junction with Route 28/7, 150 yards south of a point where a large powerline crosses Route 4/2, Grant County:

Ap—0 to 4 inches, very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; friable; many roots; 15 percent coarse fragments; medium acid; abrupt wavy boundary.

B1—4 to 12 inches, brown (7.5YR 4/4) channery silt loam; weak fine subangular blocky structure; friable; common roots; 20 percent coarse fragments; medium acid; clear wavy boundary.

B21t—12 to 22 inches, dark reddish brown (5YR 3/4) channery silt loam; weak medium subangular blocky structure; friable; common roots; few discontinuous clay films on faces of peds; 15 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—22 to 34 inches, dark reddish brown (2.5YR 3/4) channery silty clay loam; moderate medium subangular blocky structure; friable; few roots; many discontinuous clay films on faces of peds; 20 percent coarse fragments; strongly acid; clear wavy boundary.

B3—34 to 49 inches, dark reddish brown (2.5YR 3/4) channery clay loam; weak fine subangular blocky structure; firm; few roots; few discontinuous clay films on faces of peds; 40 percent coarse fragments; strongly acid; gradual wavy boundary.

C—49 to 60 inches, dark reddish brown (5YR 3/3) channery loam; massive; firm; few roots; 35 percent coarse fragments; strongly acid.

The solum thickness ranges from 45 to 60 inches. The depth to bedrock is more than 60 inches. Coarse fragments of sandstone, siltstone, or shale make up 5 to 20 percent of the upper part of the solum and 5 to 40 percent of the lower part of the solum and the C horizon. In unlimed areas the soil is medium acid to strongly acid.

The A horizon has hue of 10YR through 7.5YR, value of 3 through 5, and chroma of 2 through 4.

The B horizon has hue of 10YR through 2.5YR, value of 3 through 5, and chroma of 4 through 8. It is loam, silt loam, silty clay loam, or clay loam or their channery phases. The B horizon has weak or moderate, fine or medium, subangular blocky structure. It is friable or firm.

The C horizon has hue of 10YR through 2.5YR, value of 3 through 5, and chroma of 3 through 8. It is loam, silt loam, silty clay loam, or clay loam or their channery phases. It is friable or firm.

The Shouns soils in this survey area are a taxadjunct to the Shouns series because they contain more coarse fragments and have lower value and chroma than defined in the range for the series. These differences do not significantly affect the use and management of the soils.

Tioga Series

The Tioga series consists of deep, well drained soils that formed in alluvial material washed from lime-influenced soils on uplands. The Tioga soils are on flood plains. Slopes range from 0 to 3 percent.

Tioga soils are in the Valley and Ridge province in this survey area. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Tioga soils are on the landscape with excessively drained Potomac soils; well drained Chagrin and Huntington soils; moderately well drained Basher, Lindside, and Lobdell soils; poorly drained Melvin soils; and very poorly drained or poorly drained Dunning soils. The Tioga soils have less sand and fewer coarse fragments than the Potomac soils; have more sand than the Huntington, Lindside, Lobdell, or Melvin soils; and have less clay and more sand than the Dunning soils.

Typical pedon of Tioga fine sandy loam, about 400 yards east of the intersection of Route 7 and Kade Run, about 200 yards west of the South Fork of the South Branch of the Potomac River, in a garden about 10 yards south of the access road, Hardy County:

Ap—0 to 8 inches, dark yellowish brown (10YR 3/4) fine sandy loam; weak fine and medium granular structure; very friable; common roots; 1 percent coarse fragments; medium acid; clear wavy boundary.

B1—8 to 13 inches, brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; friable; few roots; 1 percent coarse fragments; medium acid; clear wavy boundary.

B21—13 to 22 inches, dark brown (10YR 3/3) loam; weak medium subangular blocky structure; friable; few roots; 1 percent coarse fragments; neutral; gradual wavy boundary.

B22—22 to 36 inches, dark brown (10YR 3/3) sandy loam; weak medium subangular blocky structure; friable; few roots; 1 percent coarse fragments; neutral; abrupt wavy boundary.

IIC1—36 to 41 inches, dark yellowish brown (10YR 4/4) very gravelly loamy sand; single grain; very friable; 50 percent coarse fragments; neutral; abrupt wavy boundary.

IIIC2—41 to 45 inches, dark yellowish brown (10YR 4/4) sandy loam; massive; very friable; 1 percent coarse fragments; neutral.

IVC3—45 to 60 inches, dark yellowish brown (10YR 4/4) very gravelly loamy sand; single grain; loose; 70 percent coarse fragments; neutral.

The solum thickness ranges from 18 to 40 inches. The depth to bedrock is more than 60 inches. Coarse fragments of gravel and cobbles make up 0 to 35 percent of the solum and 0 to 70 percent of the C horizon. The soil is strongly acid to neutral in the solum and medium acid to neutral in the C horizon.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 2 through 4.

The B horizon has hue of 10YR or 7.5YR, value of 3 through 5, and chroma of 2 through 4. It mainly is fine sandy loam, sandy loam, or loam, but some thin subhorizons are loamy sand or their gravelly phases. The B horizon has weak or moderate, fine or medium, subangular blocky structure. It is friable or very friable.

The C horizon has hue of 10YR or 7.5YR value of 4 or 5, and chroma of 2 or 4. It is sand, loamy sand, sandy loam, or loam or their gravelly or very gravelly phases. It is friable to loose.

Tygart Series

The Tygart series consists of deep, poorly drained soils that formed in alluvial material washed from acid soils on uplands. Tygart soils are on terraces mainly along rivers. Slopes range from 0 to 8 percent.

Tygart soils are in the Valley and Ridge province. Mean annual temperature is 51 degrees F, and mean annual precipitation is 34 inches.

Tygart soils are on the landscape with well drained Allegheny soils, moderately well drained Monongahela and Tygart Variant soils, and poorly drained or very poorly drained Purdy soils. The Tygart soils have more clay than the Allegheny or Monongahela soils, do not have the fragipan characteristic of the Monongahela soils, and have fewer coarse fragments than the Tygart Variant soils.

Typical pedon of Tygart silt loam, 0 to 3 percent slopes, in southeastern corner of a pasture, about 20 yards north of a farm lane, about 1/4 mile west of Route 6, about 2.25 miles north of its junction with Route 220/9, Hardy County:

Ap—0 to 11 inches, dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many roots; 2 percent coarse fragments; neutral; abrupt smooth boundary.

B1—11 to 15 inches, yellowish brown (10YR 5/4) silty clay loam; few fine yellowish red (5YR 5/6) and pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; common roots; medium acid; gradual wavy boundary.

B21t—15 to 24 inches, pale brown (10YR 6/3) silty clay; common fine and medium yellowish red (5YR 4/6) and grayish brown (2.5Y 5/2) mottles and few medium light brownish gray (2.5Y 6/2) mottles; moderate medium and coarse subangular blocky structure; friable and firm; few roots; continuous clay films on faces of peds; medium acid; clear wavy boundary.

B22tg—24 to 34 inches, gray (N 6/0 and N 5/0) silty clay; many fine and medium strong brown (7.5YR 5/6) mottles and common fine and medium yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; firm; few roots; continuous clay films on faces of peds; strongly acid; gradual wavy boundary.

B3tg—34 to 43 inches, mixed gray (N 5/0 and N 6/0), and strong brown (7.5YR 5/6) silty clay; few fine and medium yellowish red (5YR 4/6) mottles; moderate medium platy structure; firm; many discontinuous clay films on faces of peds; very strongly acid; clear wavy boundary.

Cg—43 to 65 inches, mixed gray (N 6/0) and strong brown (7.5YR 5/6) silty clay; common fine and medium gray (N 5/0) mottles and few fine yellowish red (5YR 5/6) mottles; massive; firm; very strongly acid.

The solum thickness ranges from 35 to 60 inches. The depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 0 to 3 percent. In unlimed areas the soil is strongly acid or very strongly acid.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3.

In the upper part the B horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 through 6. In the lower part it is neutral or has hue of 10YR or 2.5Y, value of 6 or 7, and chroma of 0 through 2. The B horizon is silty clay loam, silty clay, or clay. It has weak or moderate, medium to coarse, subangular blocky structure or weak to moderate, fine to coarse, platy structure. It is friable or firm.

The C horizon is neutral or has hue of 10YR or 2.5Y, value of 5 through 7, and chroma of 0 through 2. It is silty clay loam, silty clay, or clay. It is friable or firm.

Tygart Variant

The Tygart Variant consists of deep, moderately well drained soils that formed in alluvial material washed from acid soils on uplands. The Tygart Variant soils are on terraces along small streams mainly in Grant County. Slopes range from 3 to 8 percent.

Tygart Variant soils are in the Valley and Ridge province. Mean annual temperature is 51 degrees F, and mean annual precipitation is 34 inches.

Tygart Variant soils are on the landscape with moderately well drained Monongahela soils and somewhat poorly drained Tygart soils. The Tygart Variant soils have more clay than the Monongahela soils, do not have the fragipan characteristic of the Monongahela soils, and have more coarse fragments than the Tygart soils.

Typical pedon of Tygart Variant cobbly silt loam, 3 to 8 percent slopes, about 30 yards south of Route 42/6, about 3/4 mile south of its junction with WV Route 42, Grant County:

Ap1—0 to 2 inches, very dark grayish brown (10YR 3/2) cobbly silt loam; moderate fine granular structure; very friable; many roots; 25 percent coarse fragments; neutral; clear wavy boundary.
Ap2—2 to 7 inches, yellowish brown (10YR 5/4) gravelly silt loam; weak medium platy structure; friable; many roots; 20 percent coarse fragments; strongly acid; abrupt smooth boundary.
B1—7 to 10 inches, strong brown (7.5YR 5/6) silty clay loam; weak and moderate medium subangular blocky structure; friable; common roots; 10 percent coarse fragments; strongly acid; clear wavy boundary.
B21t—10 to 19 inches, strong brown (7.5YR 5/6) silty clay loam; common medium red (2.5YR 5/6) mottles; moderate fine subangular blocky structure; friable; few roots; few discontinuous clay films on faces of peds and in pores; 5 percent coarse fragments; very strongly acid; gradual wavy boundary.
B22t—19 to 27 inches, mixed red (2.5YR 4/6) and pinkish gray (7.5YR 6/2) silty clay; moderate fine angular blocky structure; friable; few roots; continuous clay films on faces of peds and in pores; 10 percent coarse fragments; strongly acid; gradual wavy boundary.
IIB23t—27 to 40 inches, mixed red (2.5YR 4/8), strong brown (7.5YR 5/6), and pinkish gray (7.5YR 6/2) very cobbly silty clay loam; moderate very fine angular blocky structure; firm; few roots; continuous clay films on faces of peds and in pores; 50 percent coarse fragments; very strongly acid; gradual wavy boundary.
IIB3t—40 to 60 inches, mixed red (2.5YR 4/8), strong brown (7.5YR 5/6), and pinkish gray (7.5YR 6/2) very cobbly silty clay; weak medium subangular blocky structure; firm; few roots; continuous clay films on faces of peds and in pores; 70 percent coarse fragments; very strongly acid.

The solum thickness ranges from 30 to 70 inches, and depth to bedrock is more than 60 inches. Coarse fragments of cobbles and gravel make up 15 to 30 percent of the A horizon, 5 to 30 percent of the upper part of the B horizon, and as much as 75 percent of the lower part of the B horizon and the C horizon. In unlimed areas the soil is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 2 through 4.

The B horizon has hue of 2.5YR through 7.5YR, value of 4 through 7, and chroma of 2 through 8. It is silty clay loam or silty clay or their cobbly, very cobbly, gravelly, or very gravelly phases. The B horizon has weak or moderate, fine or medium, subangular blocky or blocky structure. It is friable or firm.

The C horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 2 through 6. It is gravelly, very gravelly, cobbly, or very cobbly phases of silty clay loam, silty clay, or clay. It is friable or firm.

Udorthents

Udorthents in Grant and Hardy Counties consist of a mixture of soil and rock that have been significantly disturbed by man, or they consist of areas of very shallow, shaly soil. Udorthents are excavated or filled areas around construction sites, areas surface-mined for coal, or very shallow, excessively drained soils formed in acid material weathered from shale on hillsides and escarpments. Slopes range from 0 to 80 percent.

Udorthents are in the Valley and Ridge province and on the Appalachian Plateaus. In the Valley and Ridge province, mean annual precipitation is 34 inches and mean annual temperature is 51 degrees F. On the Appalachian Plateaus, mean annual precipitation is 47 inches and mean annual temperature is 47 degrees F.

Udorthents in this survey area consist of many different kinds of pedons, none of which is considered typical. A pedon used as a reference for Udorthents is in an area of Udorthents, Sandstone and Mudstone, low base, about 350 yards west of Helmick Run, about 1 mile east of Stony River Dam, about 50 yards north of the access road that leads from the dam to Jordan Run, Grant County:

A—0 to 4 inches, dark brown (10YR 3/3) channery loam; few fine yellowish brown (10YR 5/6) mottles; weak fine granular structure; many roots; 35 percent coarse fragments (40 percent sandstone, 50 percent mudstone, 10 percent coal); strongly acid; clear wavy boundary.
C1—4 to 20 inches, very dark grayish brown (10YR 3/2) very channery loam; common fine and medium yellowish brown (10YR 5/8) mottles; massive; common roots; 70 percent coarse fragments (35 percent sandstone, 60 percent mudstone, 5 percent coal); very strongly acid; gradual wavy boundary.
C2—20 to 45 inches, dark yellowish brown (10YR 4/4) channery loam; common fine and medium strong brown (7.5YR 5/8) and brown (10YR 5/3) mottles; massive; 45 percent coarse fragments (60 percent sandstone, 25 percent mudstone, 15 percent coal); very strongly acid.

Areas mapped as Udorthents, Sandstone and Mudstone, low base, consist of soils made by surface mining in western Grant County on Allegheny Mountain. If unlimed, they are extremely acid to strongly acid. They have some properties which are characteristic of soils made during surface mining. For example, coarse

fragments generally make up at least 35 percent of the volume of the soil; coarse fragments are disordered; the amount and arrangement of mottles are unrelated to the depth in the profile; coarse fragments commonly are broken and have angular edges; voids in the profile are discontinuous and variable in size, distribution, and frequency; the profile generally has a surface horizon which is mainly 4 inches or less in thickness and generally has fewer coarse fragments than the underlying horizons have; the profile has pockets of variable materials from original placement of materials during mining and reclamation; artifacts such as paper, wire, logs, cans, and glass are in most profiles; fragments of coal generally are scattered throughout the profile; and the profile contains a mixture of rock types, with no single type making up more than 65 percent of the total coarse-fragment content of the control section.

Areas mapped as Udorthents, smoothed, are throughout the survey area. Their content is variable, but they consist mostly of mixed soil and rock that has been excavated, graded, or filled. Coarse fragments vary in size, kind, and amount. In places the soil material has been transported several hundred yards from the excavated area to the fill site.

In the Lithic Udorthents, the solum thickness ranges from 0 to 8 inches. The depth to bedrock is less than 10 inches. Coarse fragments of shale make up 35 to 85 percent of the solum and 50 to 80 percent of the C horizon. Lithic Udorthents are strongly acid or very strongly acid.

These soils commonly do not have an A horizon, and the C horizon is at the surface. The C horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 3 through 8. It is very shaly or very channery phases of silt loam or loam. It is friable or very friable.

Weikert Series

The Weikert series consists of shallow, well drained soils that formed in acid material weathered mostly from shale and some siltstone and sandstone. The Weikert soils are on ridgetops, benches, and hillsides. Slopes range from 3 to 65 percent.

Weikert soils are in the Valley and Ridge province. Mean annual precipitation is 34 inches, and mean annual temperature is 51 degrees F.

Weikert soils are on the landscape with excessively drained Rushtown soils; well drained Berks, Calvin, Edom, and Mertz soils; moderately well drained Clarksburg and Ernest soils; and Lithic Udorthents. The Weikert soils are shallower than any of those soils except the Lithic Udorthents, do not have the reddish brown color characteristic of the Calvin soils, have less clay and more coarse fragments than the Edom soils, and have more coarse fragments than and do not have the fragipan characteristic of the Clarksburg and Ernest soils.

Typical pedon of Weikert shaly silt loam, in an area of Berks-Weikert shaly silt loams, 25 to 65 percent slopes, in a wooded area about 50 yards east of Route 42/7, about 0.9 mile west of its intersection with WV Route 42, Grant County:

A1—0 to 1 inch, dark brown (10YR 3/3) shaly silt loam; weak fine granular structure; very friable; many roots; 35 percent coarse fragments; strongly acid; clear wavy boundary.

A2—1 to 5 inches, grayish brown (10YR 5/2) shaly silt loam; weak fine granular structure; very friable; many roots; 35 percent coarse fragments; strongly acid; clear wavy boundary.

B2—5 to 9 inches, yellowish brown (10YR 5/6) very shaly silt loam; weak fine subangular blocky structure; friable; common roots; 65 percent coarse fragments; strongly acid; clear wavy boundary.

C—9 to 17 inches, strong brown (7.5YR 5/6) very shaly silt loam; massive; friable; common roots; 80 percent coarse fragments; strongly acid; clear irregular boundary.

R—17 inches, fractured brown and red shale, siltstone, and thin sandstone.

The solum thickness ranges from 8 to 20 inches, and the depth to bedrock ranges from 10 to 20 inches. Coarse fragments, mostly of shale and some siltstone and sandstone, make up 20 to 50 percent of the A horizon, 30 to 65 percent of the B horizon, and 60 to 85 percent of the C horizon. In unlimed areas the soil is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 2 through 5, and chroma of 1 through 3.

The B horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 3 through 6. It is shaly, very shaly, channery, or very channery phases of silt loam or loam. It has weak or moderate, fine or medium, subangular blocky structure. It is friable or very friable.

The C horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 3 through 6. It is very shaly or very channery phases of silt loam or loam. It is friable or very friable.

Wharton Series

The Wharton series consists of deep, moderately well drained soils that formed in acid material weathered mostly from shale and some siltstone and sandstone. The Wharton soils are on ridgetops, benches, and hillsides on Allegheny Mountain in the western part of Grant County. Slopes range from 3 to 35 percent.

Wharton soils are on the Appalachian Plateaus. Mean annual temperature is 47 degrees F, and mean annual precipitation is 47 inches.

Wharton soils are on the landscape with well drained or excessively drained Leetonia soils, well drained

Clymer and Gilpin soils, somewhat poorly drained Cavode soils, somewhat poorly drained or poorly drained Buchanan Variant soils, and very poorly drained Lickdale soils. The Wharton soils have more clay and fewer coarse fragments than the Leetonia soils, are deeper than the Gilpin soils, have less clay than the Cavode soils, have more sand than the Buchanan Variant soils, and do not have the fragipan characteristic of the Buchanan soils.

Typical pedon of Wharton silt loam in an area of Wharton stony silt loam, 3 to 8 percent slopes, about 250 yards southeast of Cherry Ridge Road, about 1 mile from its junction with US Route 50, near Union High School, Grant County:

A1—0 to 2 inches, very dark gray (10YR 3/1) silt loam; moderate fine granular structure; very friable; many roots; 10 percent coarse fragments; strongly acid; abrupt wavy boundary.

A2—2 to 6 inches, dark brown (10YR 4/3) silt loam; weak medium granular structure; friable; many roots; 10 percent coarse fragments; strongly acid; clear wavy boundary.

B1—6 to 12 inches, yellowish brown (10YR 5/6) channery silt loam; weak fine subangular blocky structure; friable; common roots; 15 percent coarse fragments; very strongly acid; clear wavy boundary.

B21—12 to 17 inches, strong brown (7.5YR 5/6) silt loam; moderate fine subangular blocky structure; friable; few roots; 5 percent coarse fragments; very strongly acid; gradual wavy boundary.

B22t—17 to 21 inches, strong brown (7.5YR 5/6) silty clay loam; few medium pinkish gray (7.5YR 6/2) mottles and common fine and medium yellowish red (5YR 5/8) mottles; moderate fine subangular blocky structure; friable; few roots; few discontinuous clay films on faces of peds; 5 percent coarse fragments; very strongly acid; gradual wavy boundary.

B23t—21 to 26 inches, strong brown (7.5YR 5/6) silty clay loam; common medium pinkish gray (7.5YR 6/2) and yellowish red (5YR 5/8) mottles; few black coatings on faces of peds; moderate medium subangular blocky structure; friable; few roots; many discontinuous clay films on faces of peds; 5 percent coarse fragments; very strongly acid; gradual wavy boundary.

B3t—26 to 38 inches, strong brown (7.5YR 5/6) channery silty clay loam; common medium pinkish gray (7.5YR 6/2) and yellowish red (5YR 5/8) mottles; common black coatings on faces of peds; weak fine subangular blocky structure; friable; few roots; few discontinuous clay films on faces of peds; 15 percent coarse fragments; very strongly acid; clear wavy boundary.

C1—38 to 49 inches, strong brown (7.5YR 5/6) channery silty clay loam; many medium pinkish gray (7.5YR 6/2) and yellowish red (5YR 5/8) mottles; many black coatings on faces of peds; massive; friable; few roots; 15 percent coarse fragments; very strongly acid; clear wavy boundary.

C2—49 to 52 inches, pinkish gray (7.5YR 7/2) silty clay loam; many medium yellowish red (5YR 5/8) mottles; massive; friable; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

C3—52 to 58 inches, brownish yellow (10YR 6/6) channery silt loam; many medium light gray (10YR 7/2) mottles and common fine and medium yellowish red (5YR 5/8) mottles; common black coatings on faces of peds; massive; firm; 40 percent coarse fragments; very strongly acid; abrupt wavy boundary.

R—58 inches, sandstone and siltstone.

The solum thickness ranges from 30 to 55 inches, and the depth to bedrock is more than 40 inches. The content of coarse fragments ranges from 5 to 20 percent in the solum and from 5 to 40 percent in the C horizon. In unlimed areas the soil is strongly acid to extremely acid.

The A horizon has hue of 10YR, value of 2 through 5, and chroma of 1 through 4.

The B horizon has hue of 10YR through 7.5YR, value of 4 through 6, and chroma of 2 through 8. It mainly is silty clay loam or silt loam or their channery phases, but a few thin horizons are clay loam, loam, or silty clay. It has weak to strong, fine or medium, subangular blocky or blocky structure and is friable or firm.

The C horizon has hue of 10YR or 7.5YR, value of 4 through 7, and chroma of 2 through 6. It is silty clay loam, silt loam, or loam or their channery phases. It is friable to firm.

Morphology of Soils

The results of the soil-forming processes can be observed in the different layers, or horizons, in the soil profile. The profile extends from the soil surface downward to materials that are little changed by the soil-forming processes. Most soils contain three major horizons, called the A, B, and C horizons. These horizons can be further subdivided by the use of numbers and letters to indicate changes within the major horizon.

The A horizon is the surface layer. It is the layer that has the maximum accumulation of organic matter. It is also the layer of maximum leaching, or eluviation, of clay and iron.

The B horizon underlies the A horizon and is commonly called the subsoil. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, or other compounds leached from the surface layer. The B horizon commonly has blocky structure and is generally more firm and lighter in color than the A horizon.

The C horizon is below the A and B horizons. It consists of material that is modified by weathering but is altered little by the soil-forming processes.

In the survey area, many processes are involved in the formation of soil horizons. The more important of these are the accumulation of organic matter, the leaching of soluble salts, the reduction and transfer of iron, the formation and translocation of clay minerals, and the formation of structure. Such processes are continually taking place and have been for thousands of years.

Most of the well drained and moderately well drained soils on uplands in the survey area have a yellowish brown or strong brown B horizon. These colors are caused mainly by iron oxides. The B horizon of these soils has blocky structure, and most have translocated clay minerals.

A fragipan has formed in the B horizon of most of the moderately well drained soils on foot slopes and terraces. This layer is dense and brittle, is mottled, and has moderately slow or slow permeability to water and air. Most fragipans have a grayish color that is the result of intense reduction of iron during soil formation, a process called gleying.

Formation of the Soils

The origin and development of the soils in the survey area are given in this section. The five factors of soil formation are listed, and their influence on the soils is described. Also described are the morphology of soils, the processes of horizon development, and the geologic characteristics of the area.

Factors of Soil Formation

The soils of the survey area formed from the interaction of five major factors of soil formation: parent material, time, climate, living organisms, and topography (*4*). Each factor modifies the effects of the others. Parent material, topography, and time have produced the major differences among the soils in the survey area. Climate and living organisms generally show their influence throughout broad areas, and their effects are relatively uniform throughout the area.

Parent Material, Time, and Climate

The character of the parent material strongly influences the time required for soil formation and the nature of the soil produced. The soils of the area formed in residual, colluvial, and alluvial materials. Most formed in residual material weathered from interbedded shale, siltstone, sandstone, limestone, and some chert. For example, Berks soils formed in interbedded shale, siltstone, and fine-grained sandstone; Dekalb soils formed in sandstone; and Belmont soils formed in limestone.

The residual material is the oldest parent material in the survey area, but the soil formation from this material has been retarded by resistant rock and by slope. Consequently, some of the soils that formed in residual material are less well developed than some of the soils formed in younger material.

Colluvial material is along foot slopes and around the head of drainageways. This material moved downslope from the acid and lime-influenced residual soils. Shouns soils, for example, formed in colluvium below Belmont soils; Buchanan soils formed in colluvium below Dekalb soils; and Ernest soils formed in colluvium below Berks soils.

The parent material on terraces and flood plains was washed from acid and lime-influenced soils on uplands. The soil-forming processes have had considerable time to act on the terrace material. Many additions, losses, and alterations have taken place. The resulting soils, such as Tygart and Monongahela soils, are strongly leached and moderately well developed.

The alluvial deposits on the flood plains are the youngest parent material in the survey area. Much of the material is physically well suited to soil formation, but the soil-forming processes have had little time to act. Most soils on flood plains are weakly developed. Chagrin, Lindside, and Melvin are examples of soils on flood plains.

Climate is relatively uniform throughout most of the survey area except at the higher elevations of Allegheny Mountain in the western part of Grant County. There, the mean annual precipitation is 38 percent higher and the mean annual temperature is more than 4 degrees lower than that in the rest of the survey area. In general, the soils that formed in shale bedrock in the area of higher rainfall are higher in clay content than are the soils that formed in shale in the area of lower rainfall. Also, poorly drained soils and very poorly drained soils are more common in the area of higher rainfall. A more detailed description of climate is given in the section "General Nature of the Survey Area."

Living Organisms

All living organisms—vegetation, animals, bacteria, and fungi—affect soil formation. The kind and amount of vegetation are generally responsible for the amount of organic matter, the color of the surface layer, and, in part, the amount of nutrients. Earthworms and burrowing animals help keep the soil open and porous, and they mix organic matter and mineral matter by moving the soil to the surface. Bacteria and fungi decompose organic matter, thus releasing nutrients for plant food. Man influences the characteristics of the surface layer by clearing the forest and plowing.

Topography

Topography affects soil formation by its effect on the amount of water moving through the soil, the amount and rate of runoff, and the rate of erosion.

Gently sloping and strongly sloping soils have had large amounts of water move through them. This condition favors the formation of deep, moderately developed to well developed soils. On the steep and very steep hillsides, less water moves through the soil

and the amount and rate of runoff are greater. In addition, the soil material is washed away almost as rapidly as it forms. Thus, it is likely that the soils on the steeper hillsides will be less deep to bedrock than the soils on the more gentle slopes.

The topography in this survey area is favorable for formation of soils on flood plains and young terraces, and formation is progressing at a rather rapid rate. Soils on flood plains are weakly developed, however, mainly because too little time has elapsed since the material was deposited.

Geology

Gordon B. Bayles and Brian W. Ganoe, geologists, Soil Conservation Service, assisted with the preparation of this section.

Uplift, folding, and geologic erosion have had a strong influence on the landforms of Grant and Hardy Counties. The relative resistance to erosion of various rocks coupled with the folding have affected the topography of the counties. The parallel ridges and valleys are oriented in a northeast-southwest direction. Rock outcrops follow this orientation, and the erosion-resistant sandstones make up the ridgetops and the softer, erosive shale and limestone formations make up the valleys.

The uplifted and folded geology has made the survey area rugged, scenic, and attractive to tourists. It also has caused some problems. For example, the height of flooding is increased above the water gaps where the rivers flow through narrow breaks in the anticlines (*11*). Also, the steeply dipping bedrock on the flanks of the anticlines act as a plane along which soils sometimes slide when they become saturated with water.

The survey area is in two principal geologic provinces, the Appalachian Plateaus province and the Valley and Ridge province, each with different geologic features (*3*).

The Appalachian Plateaus province is in western Grant County and covers the highest elevations of the survey area. Part of this area is the Allegheny Front, from which waters flowing east drain into the Chesapeake Bay and waters flowing west eventually drain into the Gulf of Mexico. The surface rocks on the plateau are of the Pennsylvanian System, and they consist of the Monongahela, Conemaugh, Allegheny, and Pottsville series (*9*). These rocks are dominantly sandstone and shale and several seams of minable coal. The dominant soils in this province are Wharton, Gilpin, and Cavode soils; less extensive are Buchanan, Clymer, Leetonia, and Lickdale soils.

The Valley and Ridge province makes up the rest of Grant County and all of Hardy County. The bedrock in this province has been steeply folded and highly faulted (fig. 9). A system of roughly parallel rivers drains this area as they flow northeast toward the Chesapeake Bay. The surface rocks of this area are of the Mississippian, Devonian, Silurian, and Ordivician Systems (*10*). They consist of numerous series, ranging from the Mauch Chunk and Greenbrier, which are only on the eastern slopes of Allegheny Mountain in this survey area, to the Martinsburg series, which is in eastern Hardy County and on North Fork Mountain in Grant County. These rocks consist of shale, sandstone, siltstone, limestone, and chert. The dominant soils in this province are Berks, Weikert, Dekalb, Hazleton, Lehew, Opequon, and Elliber soils. Several alluvial and colluvial soils are in the valleys and on the lower slopes.

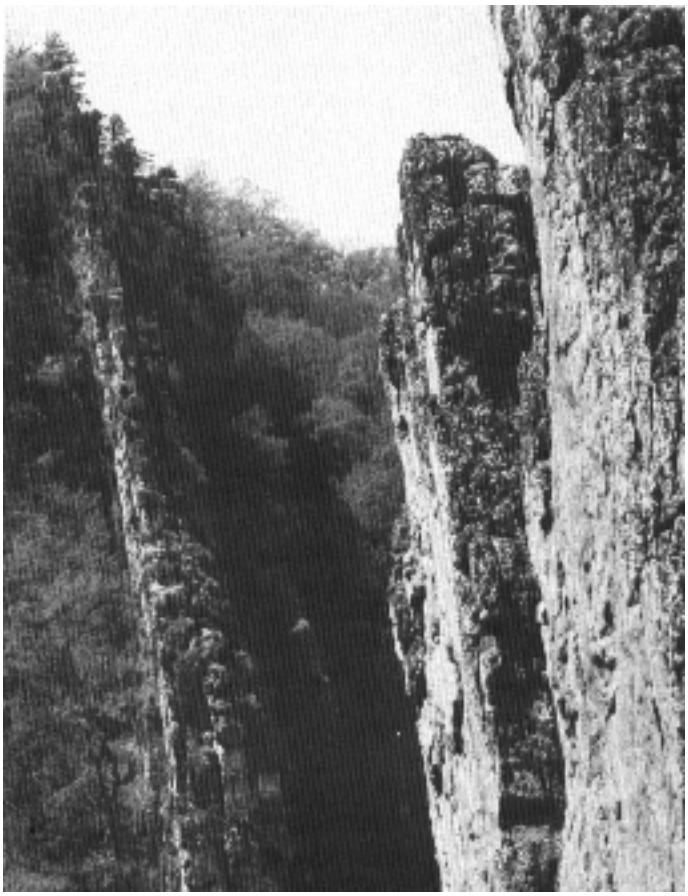

Figure 9.—Steeply folded bedrock outcrop in the Valley and Ridge province.

References

(1) American Association of State Highway and Transportation Officials. 1982. Standard specifications for highway materials and methods of sampling and testing. Ed. 13, 2 vols., illus.

(2) American Society for Testing and Materials. 1985. Standard test method for classification of soils for engineering purposes. ASTM Stand. D 2487.

(3) Austin, Morris E. 1965. Land resource regions and major land resource areas of the United States. U.S. Dep. Agric. Handb. 296, 82 pp., map.

(4) Jenny, Hans. 1941. Factors of soil formation. McGraw-Hill Book Company, Inc., 281 pp., illus.

(5) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus.

(6) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(7) United States Department of Agriculture. 1978. The forest resources of West Virginia. For. Serv. Res. Bul. NE-56, 105 pp., illus.

(8) United States Department of Commerce. 1977. 1974 census of agriculture, West Virginia state and county data. Vol. 1, Part 48, 544 pp.

(9) West Virginia Geological Survey, County Reports. 1924. Mineral and Grant Counties. 866 pp., illus.

(10) West Virginia Geological Survey, County Reports. 1927. Hampshire and Hardy Counties. 624 pp., illus.

(11) West Virginia Geological and Economic Survey. 1956. Relation of geology to drainage, floods, and landslides in the Petersburg area, West Virginia. Rep. of investig. no. 13, 19 pp., illus.

Glossary

ABC soil. A soil having an A, a B, and a C horizon.

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

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; the air 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 granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (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 moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	more than 5.2

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

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

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Cement rock. Shaly limestone used in the manufacture of cement.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

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 oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Congeliturbate. Soil material disturbed by frost action.

Conservation tillage. A tillage and planting system in which crop residue covers at least 30 percent of the soil surface after planting. Where soil erosion by wind is the main concern, the system leaves the equivalent of at least 1,000 pounds per acre of flat small-grain residue on the surface during the critical erosion period.

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; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

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

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, 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 classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Fissile. Having a tendency to split along parallel planes into layers less than 5mm thick.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lamellae. Clay-enriched horizons predominantly in sandy soils; generally only a few centimeters thick.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Lithochromic mottles. Mottles that have inherited their color from the parent rocks.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

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 the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded 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 of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. A nonfissle type of rock dominated by silt- size and/or clay-size particles. Mudstones have a moist hardness of less than 2.5 (can be scratched with fingernail). They differ from shale because of their nonfissile nature. Some mudstones contains as much as 50 percent sand-size particles if properties are judged to be dominated by silt and/or clay.

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Narrow-base terrace. A terrace no more than 4 to 8 feet wide at the base. A narrow-base terrace is similar to a broad-base terrace, except for the width of the ridge and channel.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedogenic. Refers to soil formation through natural processes.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permafrost. Layers of soil, or even bedrock, occurring in arctic or subarctic regions, in which a temperature below freezing has existed continuously for a long time.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting ground ice. They form on the soil after plant cover is removed.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size

of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

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

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salty water (in tables.) Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $Ca^{++} + Mg^{++}$. The degrees of sodicity are—

	SAR
Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

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

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. 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 without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

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 water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

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

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer of a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by melt water streams, in a glacial lake or other body of still water in front of a glacier.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide

range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

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